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ABSTRACT

This field study was conducted to develop a performance-based course, including goal statements, performance objectives, and learning activities, for a light commercial building drafting course. The procedures used during the study were based on the 1975 Michigan Department of Education project for the development of competency-based teacher education programs, and included instructional modules of program goals, performance objectives, objective-referenced testing, learning activities, follow-up, and evaluation. A job task analysis of the architectural profession was developed from a review of literature to determine typical jobs and tasks. These jobs and tasks were equated with program goals, course goals, and performance objectives. Learning activities were then arranged to support each of the performance objectives. A textbook entitled "Architecture-Design, Engineering, Drawing" was selected to augment the learning activities. The result of the study was a 10-unit, task package, performance-based course. Each unit represents a performance objective and a required drawing arranged in the order of actual construction. The evaluation of the learner's mastery of the course is determined by successful completion of each unit test and a set of drawings prepared by student teams. It was recommended that light commercial building drafting be incorporated into community college and university architectural technology programs. An evaluation study was also recommended to survey those who had completed the course and were employed in architectural drafting as a means to update the course content. (The performance-based light commercial drafting course is included as an appendix to the report.) (KC)

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DEVELOPMENT OF PERFORMANCE BASED EDUCATION FOR ARCHITECTURAL CURRICULA : INSTRUCTIONAL PROGRAM FOR LIGHT COMMERCIAL ARCHITECTURAL DRAFTING

Robert F. Ringel

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This field study is dedicated
to my mother, Doris, and my
wife, Dorothy.

ACKNOWLEDGEMENT

The writer wishes to express his appreciation to the members of his committee, Dr. James Hayes, Dr. John Nee and Dr. Harold Telfer. The courses they taught and the encouragement they gave me made this study possible.

Special acknowledgement is also extended to the typist of this document, Ms. Dorothy Tilmann; a job well done.

Robert F. Ringel

ABSTRACT

DEVELOPMENT OF PERFORMANCE BASED EDUCATION FOR ARCHITECTURAL CURRICULA : INSTRUCTIONAL PROGRAM FOR LIGHT COMMERCIAL ARCHITECTURAL DRAFTING

by Robert F. Ringel

The architectural profession provides services primarily for commercial buildings. Drafters are expected to be familiar with commercial drafting performance, so an architectural curricula is needed to provide light commercial drafting experiences for the student. It was the purpose of this field study to develop a performance based course including goal statements, performance objectives, and learning activities for a light commercial building drafting course.

The procedures utilized during the study were based on the 1975 Michigan Department of Education project for the development of competency-based teacher education programs. These programs were instructional modules of program goals, performance objectives, objective-reference testing, learning activities, follow-up and evaluation. A job task analysis of the architectural profession was developed from the review of literature to determine typical jobs and tasks. These were equated with program goals, course goals and performance objectives respectively. Learning activities were then arranged to support each of the performance objectives.

A major textbook, Architecture-Design, Engineering, Drawing, was selected to augment the learning activities. The result of the study was a ten unit task package performance based course. Each unit represented a performance objective and a required drawing arranged in the order of actual construction. The evaluation of the learner's mastery of the course was determined by successful completion of each unit test and a set of drawings prepared in a team setting.

It was recommended that light commercial building drafting be incorporated in community college and university architectural technology programs. An evaluation study was also recommended to survey those individuals in the occupation of architectural drafting who completed the course. This would provide the means to update the course content and ensure a continual feedback to the evaluation process.

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CHAPTER I

INTRODUCTION, STATEMENT OF THE PROBLEM AND DEFINITION OF TERMS

Introduction

As a continued extension of the preparation of students for an architectural career, a course in the drafting of light commercial building was determined a necessity at the community college and university architectural curricula level. Commercial drafting reflects the major daily work which provides the largest base for the architectural profession.

A basic element of the commercial architectural world of work is the drafting team. The complexity of projects requires the efforts of five to six individuals. Usually the talents of an architectural project leader, draftspersons, structural, electrical and mechanical engineers are directed toward the successful completion of a single commercial building. In order to simulate this working environment, the light commercial building drafting class should be divided into groups of five to six members, each assigned a specific portion of the project. The evaluation process encompasses the student's participation in the group in addition to completion of the task package tests and drawings.

Knowledge of light commercial drafting also familiar-

10

izes the architectural student with industrial, educational, institutional, and governmental buildings. The details and construction techniques in these types of facilities are very similar and enhanced the ability of the student to meet the challenge of the architectural field.

Statement of the Problem

Existing architectural drafting curricula that do not have a light commercial drafting course needs to provide this type of preparation for entrance into the architectural profession. The problem was to develop a performance based light commercial building drafting course for the community college and university curricula.

Limitations of the Study

This study was limited to the drafting of light commercial buildings and did not include other facilities. The program goals, performance objectives, and learning activities were developed for community college and university students who successfully completed a residential drafting course. The course was confined to one semester of sixteen (16) weeks study on a regular semester schedule. This limited the number of units to ten (10). Each unit represented a terminal performance objective.

The team concept of group design was emphasized in the performance objectives. However, the units were flexible enough for independent or individual study basis. This proved to be an asset for those students qualified to study such a program not offered as a regularly scheduled course.

Source of Data

The source of information used for this field study was obtained from a thorough search of architectural texts related to light commercial buildings. Instructional materials from curriculum development courses, teaching experience as an instructor, and twenty-five years of architectural experience were additional sources incorporated in this field.

Importance of the Study

The majority of work performed in an architectural office consists of commercial buildings. Therefore, the need for a light commercial drafting course provides this training for architectural students. It also establishes the design and construction techniques inherent to the other major building types.

This study provided the development of a performance based course with program goals, performance objectives, and learning activities for light commercial drafting. The resulting materials enabled the student to obtain the architectural drafting skills to prepare working drawings for light commercial buildings.

Method of Study

The content of this field study was based on the 1975 project funded by the Michigan Department of Education for the research and development of competency-based teacher education programs. These programs were developed into instructional modules for program goals, performance objectives, objective-referenced testing follow-up and evaluation. It formed the outline for the review of architectual literature related to the design, drafting, and construction of light commercial buildings. This outline included the incorporation of a set of building plans with the arrangement of performance objectives in the same sequence that the plans were developed. The student was led through the complete course by each plan and terminal performance objective contained in the task packages.

The information received through a curriculum development course and previous teaching experience was assimilated with the technical data. This was further complemented with the study of instructional packages, learning aids, and study guides. These sources of data were located from an educational search of books, documents, and periodicals at the Central Michigan University Park Library. A major textbook, Architecture - Design, Engineering, Drawing by William P. Spence, was selected to augment the instructor's lectures and the student's reference reading assignments.

From this information, program goals, performance objectives, and learning activities were identified as required for a light commercial drafting course. This provided the cognitive, affective, and manipulative behavior for a student's entry into the architectural drafting profession.

Definition of Terms

The terms used in this study that require clarification are:

Affective Objectives - Objectives that emphasized a feeling tone, an emotion, or a degree of acceptance or rejection (Krathwohl, Bloom, and Masia, 1964, p. 7).

Architectural Drafter - Performed duties of drafter by drawing artistic architectural and structural features of any class of buildings and like structures. Delineated designs and details, using drawing instruments (D.O.T., 1977, p. 13).

Cognitive Objectives - Objectives that emphasized remembering or reproducing something which has presumably been learned, as well as objectives which involved the solving of some intellective task for which the individual determined the essential problems and then reordered given material or combined it with ideas, methods, or procedures previously learned. (Krathwohl, Bloom and Masia, 1964, p.6).

Commercial Drafter - Performed general duties of drafter in all-around drafting, such as lay outs of location of buildings, planning of arrangements in offices, large rooms, store buildings, and factories (D.O.T., 1977, pp 32-33).

Drafter - All reference to drafter, student, designer, architect, individual and learner referred equally to both sexes.

Enabling Objective - A behavioral statement of a student's performance to complete the terminal performance. Two or more enabling objectives supported a terminal performance objective (Seraydarian, 1975, p. 41).

Objective-Reference Testing - Measured learner performance in a way described in a performance objective and evaluated against the criteria of the objective (Brown, 1975, p. 24).

Performance Objective - A statement of educational intent that indicated the behavior a student demonstrated upon successful completion of a learning experience. It contained reference to conditions, performance and criteria (Seraydarian, 1975, p. 19).

Program Goal - Program goals were general student oriented behavior statements which required the mastery of two or more performance objectives that demonstrated but did not refer to conditions or criteria (Panos, 1975, p. 22).

Psychomotor Objectives - Objectives which emphasized some manipulation of material and objects or some act which required a neuro-muscular coordination (Krathwohl, Bloom and Masia, 1964, p.7).

Specific Instructional Program - An organization of subject matter and interrelated learning experience designed for student achievement of pre-specified goals and objectives in a systematic basis. A program consisted of two or more courses (Panos, 1975, p. 14).

Terminal Performance Objective - A behavioral statement of learner outcomes typically at the end of a course. Two or more terminal performance objectives supported a course goal (Seraydarian, 1975, p. 41).

CHAPTER II

REVIEW OF RELATED LITERATURE

The architectural design industry emphasizes the drafting of light commercial buildings. Relevant information and technical literature for the development of a performance-based instructional program were reviewed. The review established that performance-based programs consisted of program goals, performance objectives, objective-referenced testing, learning activities, follow-up and evaluation. The specific instructional program identified for this field study was light commercial building architectural drafting for the community college or university.

Program Goals

Panos (1975) indicated that program goals "specify the knowledge, skills, and judgments the student will be expected to demonstrate upon completion of the program . . . identified by using . . . task analysis technique" (p. 32). The task analysis technique revealed that: "If this process is followed systematically, it provides for an updating, or feedback process, that keeps your program goals realistic" (p. 33).

Finch (1971) followed a similar instructional system that included a program needs study, task analysis, enabling objectives, criterion, field test, instructional units, and follow-up evaluation.

The task analysis identified the specific work activities and their frequency of occurrence for the architectural drafting occupational family. Included in this identification was related knowledge (knowing); required skills (doing), work environment (conditions), and accepted standards of success (criterion). The program goals were developed from the occupational family, course goals from the jobs, and performance objectives from the tasks.

Panos (1975) stated that program goals were general, student oriented, behaviorally stated, descriptive of student outcomes, but did not refer to conditions or evaluation criteria.

> Organize the program goals . . . into a logical sequence of semesters of courses which will accomplish the goals of the program. This may consist of as many semesters or courses . . . it will take to complete the goals . . .several of the program goals appear in more than one course or one semester's work . . .because it may take more than one semester's work to accomplish that goal (p. 45).

Day and Herschbach (1976) suggested that the task analysis process obtained information from on-the-job personnel with a survey instrument that gathered data of work behaviors. Nee (1977) developed this survey further by a ranked listing of jobs.

> A structure of the behaviors of the workers is obtained by developing a rank order listing of the behaviors based on the frequency and complexity of each. The most frequent, less complex operations and knowledges are taught to students first and are followed by less frequent, more complex operations, until all of the on-the-job doing operations have been mastered (p. 15).

Performance Objectives

"Performance objectives are derived from program goals . . . and that . . . two or more performance objectives must be written for one program goal" (Seraydarian, 1975, p. 31). They were categorized into performance objectives and learning activities determined from the task analysis. The learning activities were the enabling objectives that assisted the student's mastery of the performance objectives. Two or more enabling objectives were written for each performance objective.

The performance objectives were composed of the performance, the conditions, and the criteria:

A. Performance: what the learner is expected to do.

B. Conditions: the conditions under which the behavior will be expected to occur.

C. Criteria: the minimum acceptable performance that the instructor will accept as evidence of achievement of the objectives (Seraydarian, 1975, p. 24-26).

Day and Herschbach (1976) stated that the behavior mastered in every performance objective must be measurable and observable. The use of small student groups enhanced the observation of the affective behaviors achieved by the student. A group of individuals worked for a common goal and encouraged the character development and good attitude sought from the student. The proper attitude of a drafting student, combined with the correct knowledge, assisted them to be successful workers.

The method of organizing the behavioral objectives into predetermined job standards for a light commercial drafting curriculum was from the simple to the complex. If a performance objective was in a high level of one of the three behavioral domains, the learning activities to achieve this objective were constructed from the preceeding lower level of behavior. Thus, the student's mastery of a simple learning activity led to the achievement of the more complex terminal performance objective.

Performance objectives included the conditions under which the student's behavioral change was expected to occur. The student was evaluated under these job conditions and work place constraints.

> These constraints could include conditions such as student background, allowable instructional time, and available shop or laboratory facilities . . . knowledge of certain constraints might also enable the teacher to state objectives in a more meaningful manner (Finch, 1976, p. 11).

The student's mastery of a performance objective indicated that he or she met the standards of a successful architectural draftsman for that particular task. The achievement required that the criteria matched the expected behavior of each performance objective.

Objective-Referenced Testing

Objective-referenced testing measured a student's mastery of an objective. Referenced required that the measured objective referred to and used the same criteria contained in the performance objective. This contrasted to the more traditional norm-referenced testing whereby the student's mastery of performance was compared to the performance of a group. The development of objective-referenced testing contained a pretest, a pre-requisite skills test, post test, and an evaluation (Brown, 1975).

Objective-referenced testing of a performance objective required that the two main factors, condition and performance statements, set the scene for the student to be tested.

1. Check the condition for vagueness, gross assumptions, errors or omissions, etc.
2. See if the performance statement (usually an action verb) describes what the learner will actually do in the testing situation.
3. Make any adjustments or revisions in the objectives that you feel are necessary to insure fair testing of the learner (Brown, 1975, p. 66).

The prerequisite test measured the student's ability to attain the program goal. It stated what skills, knowing and doing, the student needed for entry into the course work for the drafting of light commercial buildings. The prerequisite test also gave the instructor an assessment of the student's weaknesses and strengths. This enabled the instructor to pattern his teaching strategy to suit the variety of skills inherent to each group of students.

> An important aspect of objective-referenced testing is feedback . . . evaluation of stated objectives may be used to provide feedback which can result in the improvement of instruction. For example, if students happen to be scoring poorly on a performance examination, it might be determined by the instructor that some re-

vision should be made to projects or jobs assigned to the students (Finch, 1971, p. 12).

With every evaluation of a student's mastery of the terminal performance objective, "The criterion section of any performance objective should tell us what is acceptable proof of learning" (Brown, 1975, p. 83).

Learning Activities

A learning activity was a planned experience that enabled a student's mastery of a performance objective. The learning activities were based on the instructor's strong points, the student's strengths, the resources available, the selection of materials, and the method of teaching.

The principles for the selection of materials and methods of teaching included several considerations:

1. No single media is likely to have properties that make it best for all purposes . . .
2. The precise answer to the question of which media . . . is found. . .in matching specific instructional functions with media.
3. The best media also might be determined by the particular learning style of an individual (Frankel, 1975, p. 32).

The materials selected fulfilled the criteria that accomplished the identified performance objectives and were cost effective, readily available and complemented the behaviors exhibited (Frankel, 1975).

The architectural drafting profession exhibited a major emphasis of the cognitive behavior. The cognitive levels of analysis, synthesis, and evaluation were particularly noticeable as the behavioral outcome of a draftsman. Each level of behavior was categorized into various learning activities according to what the learner and the instructor did that precipitated the anticipated behaviors.

Analysis Behavior

Learner Activity - Make details, participate in group, analyzes flow of materials, and redesigns.

Learner Outcome - Formulates a set of production plans and identifies material characteristics.

Instructor Materials - Resource books, technical manuals, catalogs, and trade journals.

Time - Informal and irregular times that may or may not take place during class periods.

Place - Planning center, drafting room, home, and in small groups (Frankel, 1975, p. 25).

Synthesis Behavior

Learner Activity - Designs, sketches, researches and develops.

Learner Outcome - Critiques, prepares a set of plans, schematic development, and technical illustrations.

Instructor Methods - Questioner, seminar participant, and serves as an industrial consultant.

Instructor Materials - Industrial specifications, collection of books, working drawings and papers, and technical reports.

Time - Formal class periods but at irregular times whenever the student is ready.

Place - Seminar room or classroom, industrial plant, construction site, home and in small groups (Frankel, 1975, p. 25).

Evaluation Behavior

Learner Activity - Determine feasibility, quality control activities, and make commitment on product values.

Learner Outcome - Evaluates critiques and efficiency reports.

Instructor Methods - Harmonizer, outside speakers, critic, and presents structural ideas.

Instructor Materials - Journals, product specifications, and standards.

Time - Informal and at irregular times that may or may not take place during class.

Place - Seminar area, classroom lab shop, in groups, or individually (Frankel, 1975, p. 25).

The key factor in the selection of learning activities was to enable the student's mastery of the behavior. "The instructor should ask himself if the resource selected will, in fact, contribute significantly to meeting stated course objectives" (Finch, 1971, p. 12). The instructors' methods were as varied as the materials. "Whatever the method, the instructor's guiding principle is that students learn best by doing" (Roueche, Herrscher, Baker, 1976, p. 16).

Follow-Up and Evaluation

Throughout the curriculum development process, every possible opportunity for feedback and course refinement was utilized to keep the performance objectives relative, current, attainable and cost effective. Even after the student mastered the curriculum content, the instructor maintained and up-dated the instructional program. Thus, the curriculum development process was a closed-loop system of improvement. The connecting link between the end and beginning of the instruction was called follow-up. The instructor validated the expected performance contained in the program. This was accomplished by gathering information on the student's actual performance.

1. Review your follow-up through the eyes of a respondent and a possible recipient of your follow-up results and evaluation.
2. Make any changes you feel would enable the recipient of your follow-up results to consider your recommendations thoroughly (Herschelmann, 1975, p. 39).

The review of the architectural technical literature, and the analysis of related instructional units and references were organized into a performance-based course. The sequence of the learning activities were arranged in the same order that an actual set of drawings a draftsman prepared. Each drawing represented a terminal performance objective attained in the form of a task package. The presentation of these findings were developed in Chapter III, Presentation of Learning Materials.

CHAPTER III

PRESENTATION OF LEARNING MATERIALS

The identification of goal statements, performance objectives, and learning activities for a performance-based drafting course of commercial buildings was accomplished through the presentation of learning materials. The specific instructional functions consisted of program goals, course goals, performance objectives, objective-referenced testing, and task packages. World-of work activities in the drafting curriculum was obtained by arranging the terminal performance objectives in the same sequence that a set of working drawings would be developed. Further teaching enhancement was made by incorporating the students into small groups, the norm for most architectural offices.

Figure 1 illustrates the relativeness of the performance-based educational model to the architectural world-of-work. The total evaluation process determined whether the instructional program enabled a student to function with satisfaction in the architectural drafting profession.

The architectural environment of constant change was the setting in which the instructional program for light commercial building drafting was developed. The course of study was designed as a continuous process of feedback for course improvement. This allowed the course to maintain relevancy in an ever changing building technology.

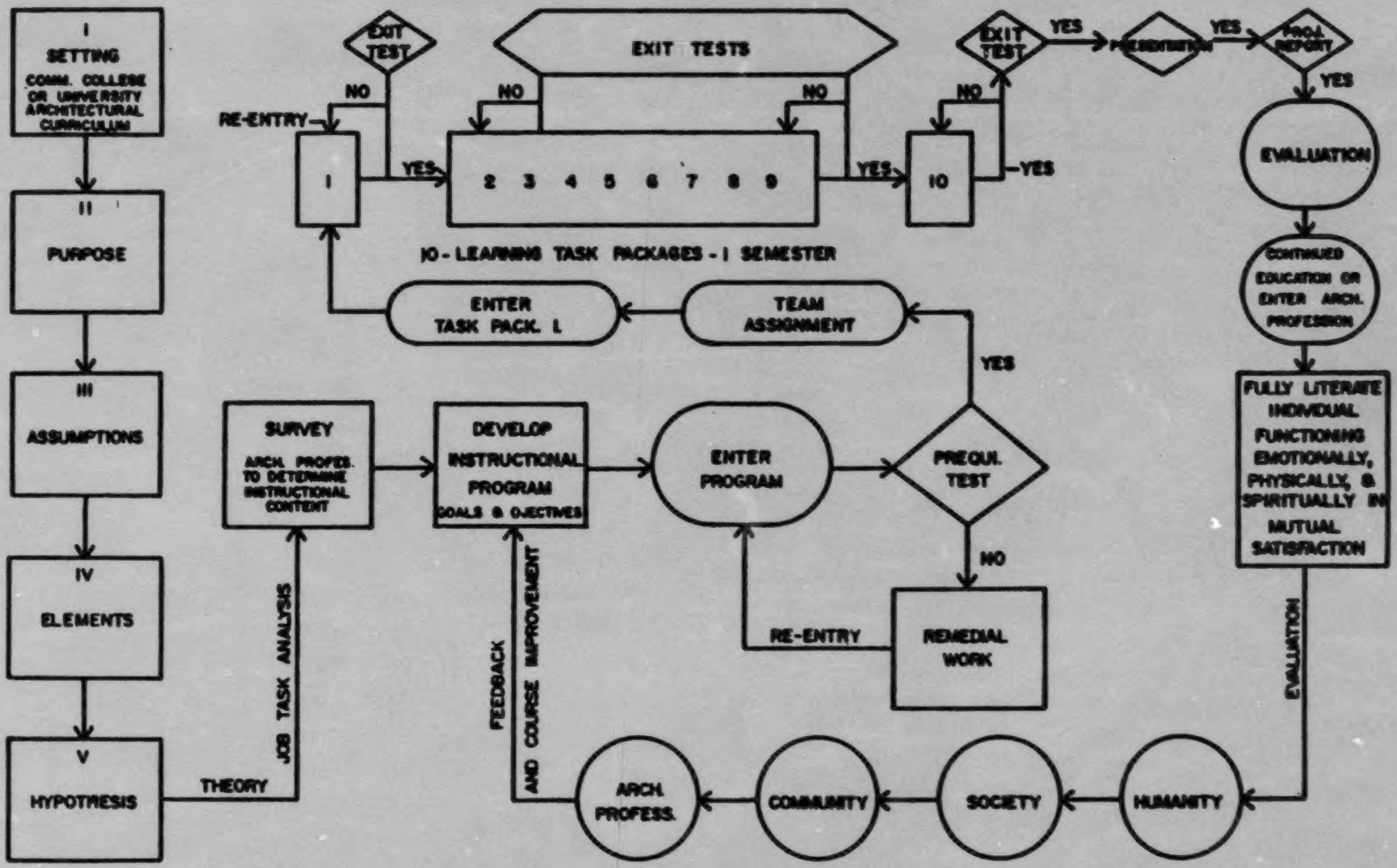

I
SETTING
COMM. COLLEGE OR UNIVERSITY ARCHITECTURAL CURRICULUM
II
PURPOSE
III
ASSUMPTIONS
IV
ELEMENTS
V
HYPOTRESIS
THEORY
JOB TASK ANALYSIS
SURVEY
ARCH. PROFES. TO DETERMINE INSTRUCTIONAL CONTENT
DEVELOP INSTRUCTIONAL PROGRAM
GOALS & OJECTIVES
ENTER PROGRAM
PREQUI. TEST
YES
NO
REMEDIAL WORK
RE-ENTRY
TEAM ASSIGNMENT
ENTER TASK PACK. I
EXIT TEST
NO
RE-ENTRY
I
YES
EXIT TESTS
NO
NO
2 3 4 5 6 7 8 9
YES
10
NO
YES
10 - LEARNING TASK PACKAGES - 1 SEMESTER
EXIT TEST
YES
PRESENTATION
YES
PROJ. REPORT
YES
EVALUATION
CONTINUED EDUCATION OR ENTER ARCH. PROFESSION
FULLY LITERATE INDIVIDUAL FUNCTIONING EMOTIONALLY, PHYSICALLY, & SPIRITUALLY IN MUTUAL SATISFACTION
EVALUATION
HUMANITY
SOCIETY
COMMUNITY
ARCH. PROFESS.
FEEDBACK AND COURSE IMPROVEMENT

Figure 1. Performance Based Education for Architectural Curricula; Instructional Program for Light Commercial Architectural Drafting.

The course was also developed to be taught to students enrolled in either the community college or university architectural curricula. However, complete flexibility was included for individualized instruction for those individuals outside a formal educational setting. The performance based light commercial building drafting fulfilled the need for this type of course for most universities and community colleges. The assumption that formed the basis for this educational model were developed from the field study. They embodied education's overall premise that:

1. Learning is an unique individual process.
2. Instructional content is derived from workers' tasks.
3. The occupation generates the program goals.
4. The jobs generate the course goals.
5. The tasks generate the performance objectives.
6. Small groups are ideal for drafting achievement.
7. The job task analysis determines the inventory of tasks.

The element present in the architectural curricula of universities and colleges that supported the light commercial building architectural drafting course was the need for a performance based instructional program that was relevant and flexible to the architectural world-of-work. This required course material to be based on a job task analysis with a continuous feedback from successful individuals that completed the course.

The theory of job task analysis identified the behaviors possessed and the frequency of tasks performed to formulate performance objectives. This provided students with the necessary learned behaviors to successfully enter continued education or the architectural drafting profession. The analysis of the architectural drafting profession determined the instructional content and established the goals and objectives. The students entered the drafting program and were required to take the prerequisite test. Failure of the test required the students to perform additional remedial work in their area of weakness. Passage of the test permitted the student to be assigned to a group and enter "Task Package Number 1 - Site Plan." With the completion of the performance objective task package, the students took the exit test. Passage of the exit test enabled the students to enter the next task package. Failure of any exit test required re-entry into the task package for remedial work.

The instructor also could utilize exit tests as prerequisite tests for each task package. This would allow advanced students to test out of each task package without entering the learning activities.

As can be seen from the conceptual model, the students passed the tenth task package, presented the commercial project completed during the course, and were evaluated by the instructor. Successful evaluation meant that the students entered into a higher educational program or entered into the architectural drafting profession. The students' success in the profession could be determined by an evaluation survey of those individuals. This survey could also be used to update and improve the instructional content.

The job task analysis was initiated with a review of occupational clusters within the world-of-work. Figure 2 identified the construction industry and the design field as the key occupation to be researched in the analysis. Figure 3 showed the subdivision of the design occupation family of the architectural drafter which generated the program goals. Figure 4 defined the architectural drafter occupation in greater detail and listed occupation classifications in order of priority.

Program Goals

Program goals for architectural curricula were identified from the task analysis illustrated in Figure 3. The specific instructional program, Community College or University Architectural Drafting Curricula, consisted of two architectural drafting courses or program goals: Architecutre I - Residential Drafting and Architecture II - Light Commercial Drafting.

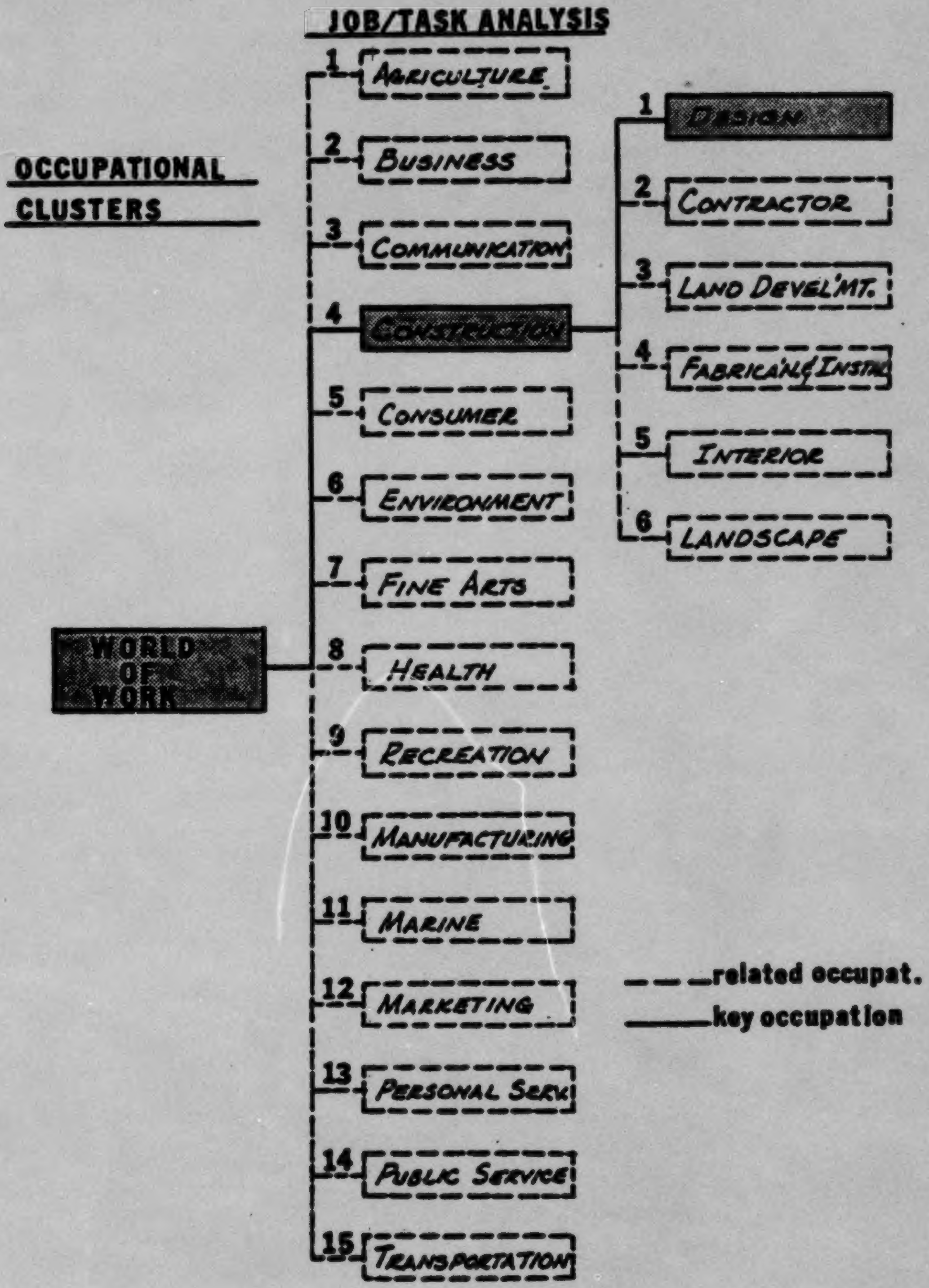

JOB/TASK ANALYSIS
OCCUPATIONAL CLUSTERS
WORLD OF WORK
1 AGRICULTURE
2 BUSINESS
3 COMMUNICATION
4 CONSTRUCTION
5 CONSUMER
6 ENVIRONMENT
7 FINE ARTS
8 HEALTH
9 RECREATION
10 MANUFACTURING
11 MARINE
12 MARKETING
13 PERSONAL SERV.
14 PUBLIC SERVICE
15 TRANSPORTATION
1 DESIGN
2 CONTRACTOR
3 LAND DEVEL'MT.
4 FABRICA'N & INSTR
5 INTERIOR
6 LANDSCAPE
— — — related occupat.
——— key occupation

Figure 2. Job/Task Analysis of Occupational Clusters in the World of Work.

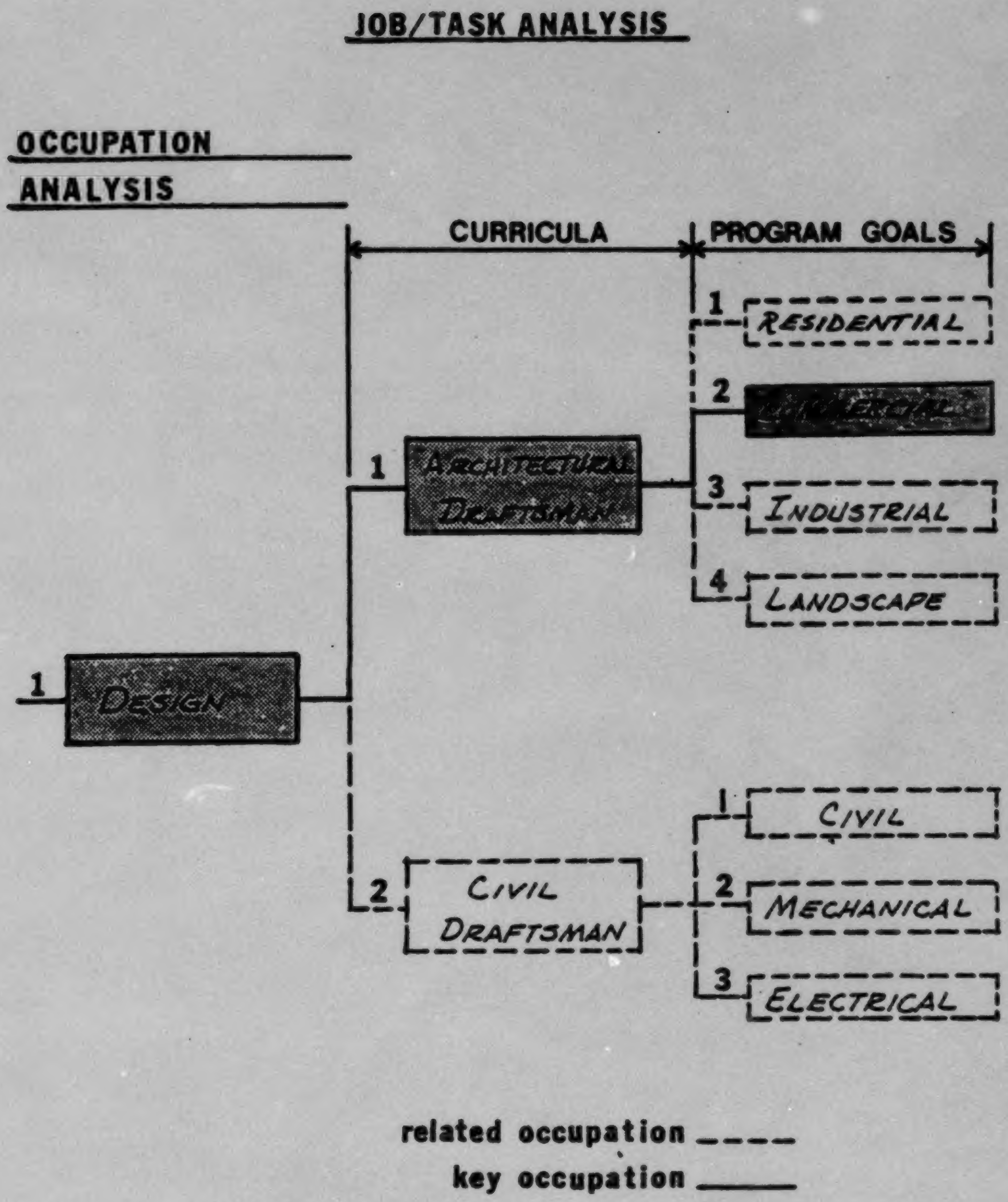
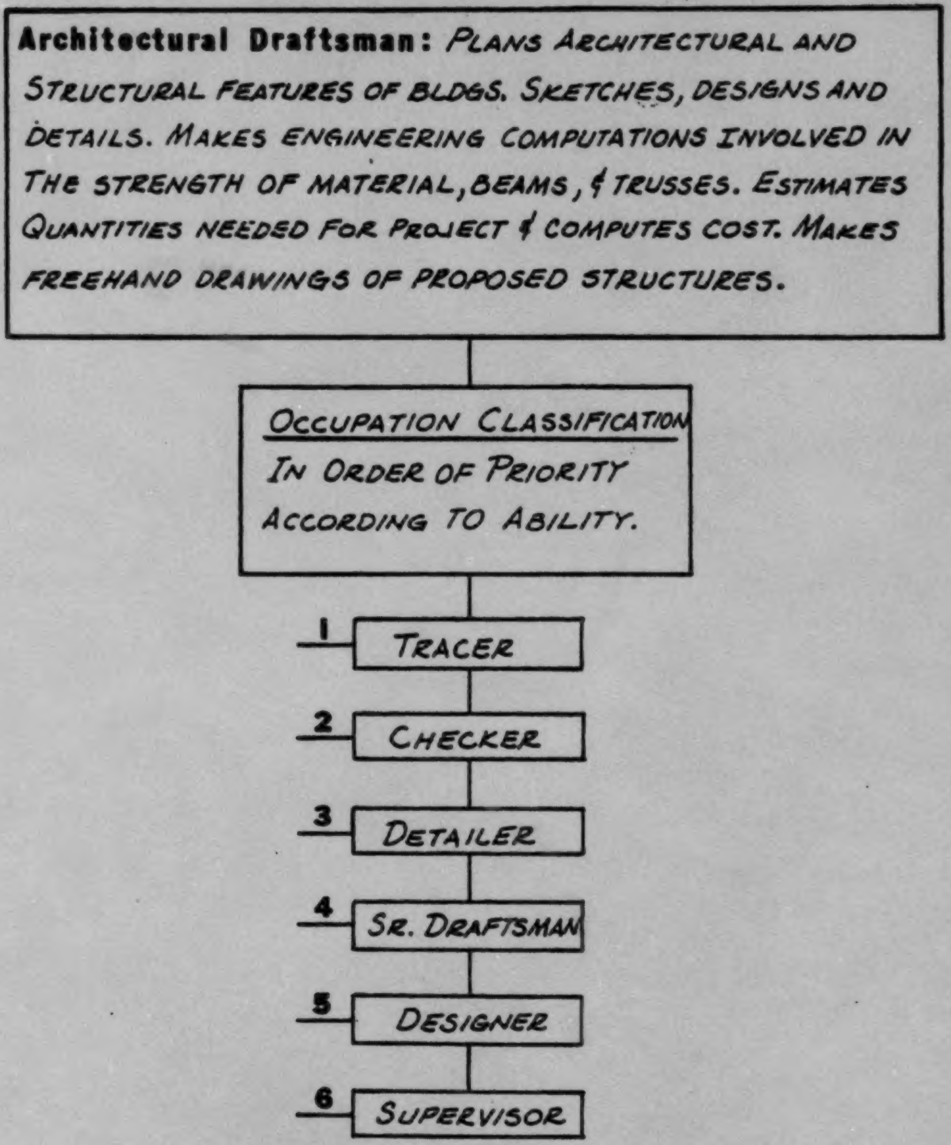

JOB/TASK ANALYSIS
OCCUPATION ANALYSIS
CURRICULA
PROGRAM GOALS
1 DESIGN
1 ARCHITECTURAL DRAFTSMAN
2 CIVIL DRAFTSMAN
1 RESIDENTIAL
2 COMMERCIAL
3 INDUSTRIAL
4 LANDSCAPE
1 CIVIL
2 MECHANICAL
3 ELECTRICAL
related occupation ----
key occupation ____

Figure 3. Occupational Analysis of Architectural Design Generated Program Goals.

JOB/TASK ANALYSIS

OCCUPATION DESCRIPTION



Architectural Draftsman: *PLANS ARCHITECTURAL AND STRUCTURAL FEATURES OF BLDGS. SKETCHES, DESIGNS AND DETAILS. MAKES ENGINEERING COMPUTATIONS INVOLVED IN THE STRENGTH OF MATERIAL, BEAMS, & TRUSSES. ESTIMATES QUANTITIES NEEDED FOR PROJECT & COMPUTES COST. MAKES FREEHAND DRAWINGS OF PROPOSED STRUCTURES.*

OCCUPATION CLASSIFICATION IN ORDER OF PRIORITY ACCORDING TO ABILITY.

1 TRACER
2 CHECKER
3 DETAILER
4 SR. DRAFTSMAN
5 DESIGNER
6 SUPERVISOR

Figure 4. Occupational Description and Classification of an Architectural Draftsman.

The architectural drafting curricula was supported by these two program goals. The program goals were matched with each of the two architectural drafting courses, each lasting for one semester. This field study developed only the light commercial building drafting course since most existing architectural curricula already have residential drafting.

COURSE NAME	PROGRAM GOAL
Architecture I Residential Drafting	After mastery of the learning activities in Architecture I, Residential Drafting, the student will possess the ability to successfully enter the architectural drafting profession for residential building or enter the Architecture II, Light Commercial Drafting Course.

COURSE NAME	PROGRAM GOAL
Architecture II Light Commercial Drafting	After mastery of the learning activities in Architecture II, Light Commercial Drafting, the student will possess the ability to successfully enter the archi-

tectural profession for light commercial buildings or continue with further education.

Course Goals

Course goals for the architectural drafting of light commercial buildings were identified from the job task analysis Figure 5. Typical jobs for a commercial architectural draftsman generated the course goals which are listed in order of importance. These course goals were typical jobs that consisted of traces, sketches, makes freehand drawings, checks drawings, makes detailed drawings, makes design layouts, and draws working plans. These were also the course goals for the residential - I, architectural drafting curricula with only a difference in the type of facility. The course goals for each of the typical jobs were developed from the least important to the most important.

Typical Job	Course Goal
1. Traces	The student will trace drawings.
2. Sketches	The student will sketch drawings.
3. Makes freehand drawings	The student will make freehand drawings.

JOB/TASK ANALYSIS

Architectural Draftsman

Typical Jobs – COURSE GOALS

	Jobs	Frequency	Importance
1	[illegible]	MOST OFTEN	LEAST IMPORT.
2	[illegible]	MOST OFTEN	LEAST IMPORT.
3	MAKES [illegible] DRWGS	MOST OFTEN	LEAST IMPORT.
4	CHECKS DRAWINGS	MOST OFTEN	IMPORTANT
5	MAKES DETAILED DRWGS	MOST OFTEN	IMPORTANT
6	MAKES DESIGN LAYOUTS	OFTEN	IMPORTANT
7	DRAWS WORKING PLANS	OFTEN	IMPORTANT
8			
9			
10			
11			
12			

Figure 5. Job/Task Analysis of Typical Jobs for a Commercial Architectural Draftsman Generated Course Goals.

4. Checks drawings	The student will check drawings.
5. Makes detailed drawings	The student will make detailed drawings.
6. Makes design layouts	The student will make design layouts.
7. Draws working plans	The student will draw a set of working plans.

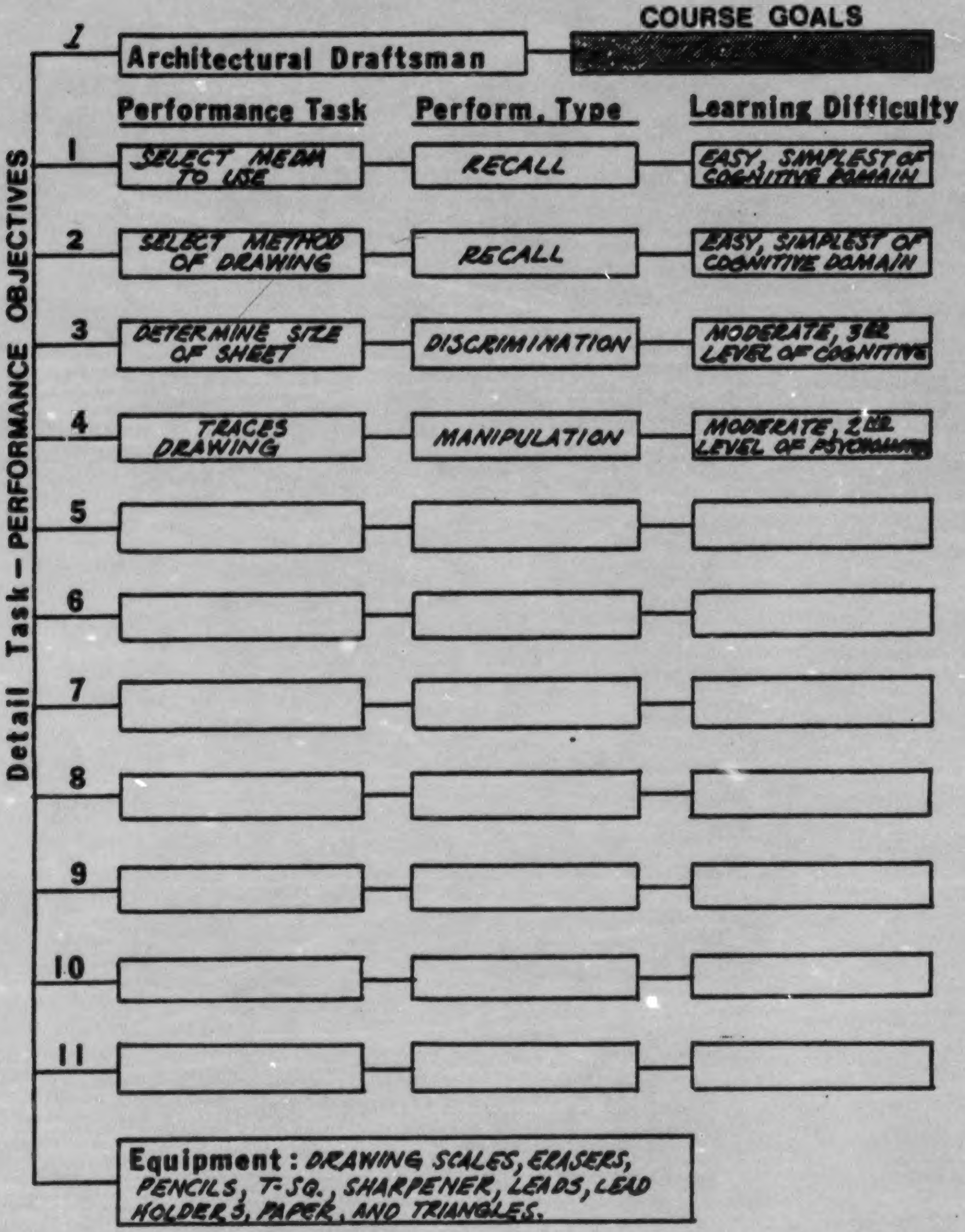
Performance Objectives

Program goals and course goals were behavioral, student-oriented, and descriptive of the student outcome. Performance objectives, however, were more precise than program goals and course goals because they stated conditions and criteria of performance.

> The conditions of a performance objective include such constraints as time or materials that may affect or limit performance. It is the condition under which the behavior will be expected to occur. Criteria are the degree of performance that will be acceptable for successful completion of the objective (Panos, 1975, p. 23).

Performance objectives were generated from the performance task detailing of each typical job of an architectural draftsman from Figure 6 through Figure 12. A list of knowing and doing behaviors including their fre-

JOB/TASK ANALYSIS



COURSE GOALS: [redacted]

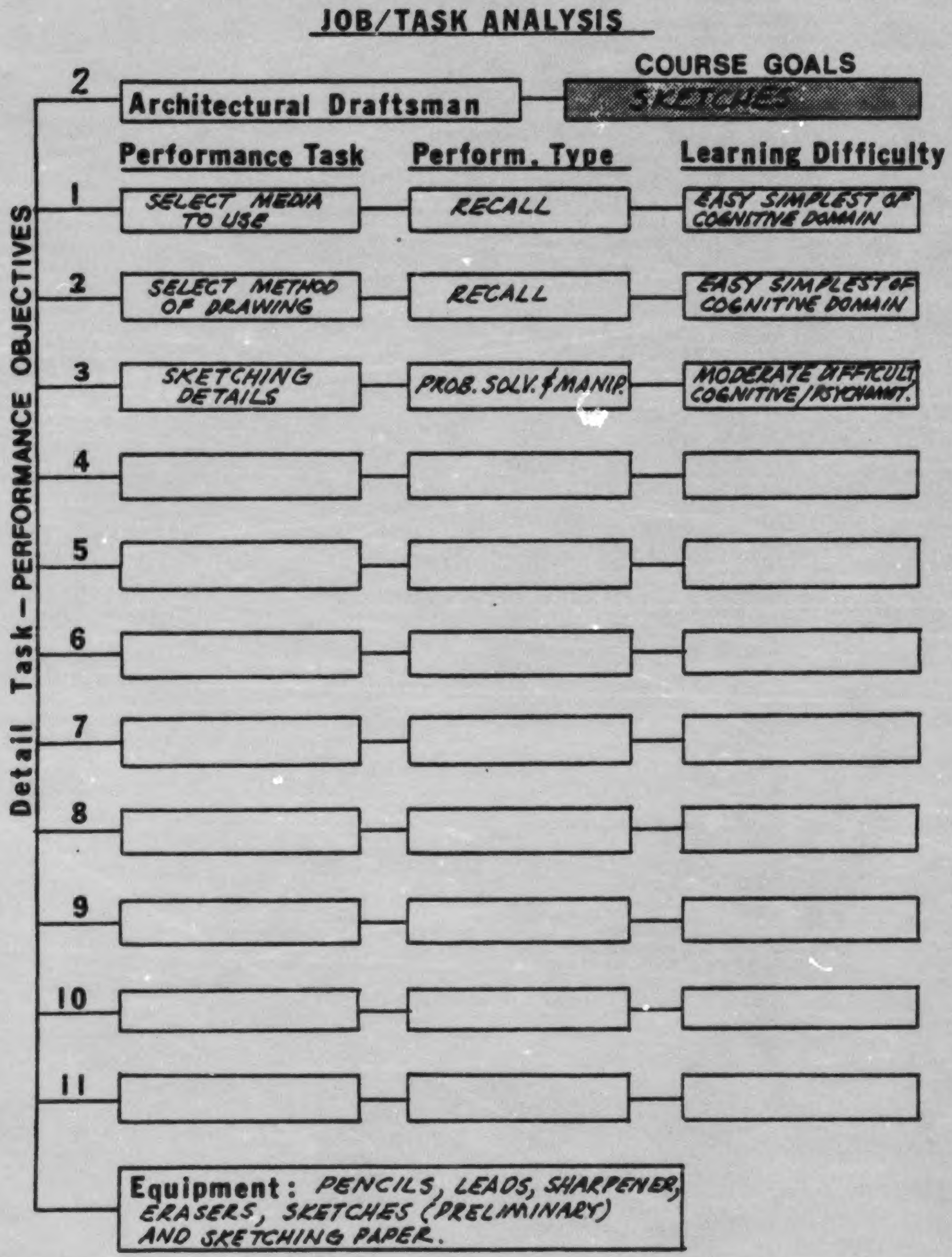
1 Architectural Draftsman

Detail Task – PERFORMANCE OBJECTIVES

	Performance Task	Perform. Type	Learning Difficulty
1	SELECT MEDIA TO USE	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
2	SELECT METHOD OF DRAWING	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
3	DETERMINE SIZE OF SHEET	DISCRIMINATION	MODERATE, 3RD LEVEL OF COGNITIVE
4	TRACES DRAWING	MANIPULATION	MODERATE, 2ND LEVEL OF PSYCHOMOTOR
5			
6			
7			
8			
9			
10			
11			

Equipment: DRAWING SCALES, ERASERS, PENCILS, T-SQ., SHARPENER, LEADS, LEAD HOLDERS, PAPER, AND TRIANGLES.

Figure 6. Performance Task Detailing of Traces Job Generated Performance Objectives.



JOB/TASK ANALYSIS

COURSE GOALS

2 **Architectural Draftsman** — SKETCHES

Detail Task — PERFORMANCE OBJECTIVES

	Performance Task	Perform. Type	Learning Difficulty
1	SELECT MEDIA TO USE	RECALL	EASY SIMPLEST OF COGNITIVE DOMAIN
2	SELECT METHOD OF DRAWING	RECALL	EASY SIMPLEST OF COGNITIVE DOMAIN
3	SKETCHING DETAILS	PROB. SOLV. & MANIP.	MODERATE DIFFICULT COGNITIVE/PSYCHOMOT.
4			
5			
6			
7			
8			
9			
10			
11			

Equipment: PENCILS, LEADS, SHARPENER, ERASERS, SKETCHES (PRELIMINARY) AND SKETCHING PAPER.

Figure 7. Performance Task Detailing of Sketches Job Generated Performance Objectives.

JOB/TASK ANALYSIS

3 **Architectural Draftsman** — COURSE GOALS: MAKES FREEHAND DRWGS.

Detail Task - PERFORMANCE OBJECTIVE

	Performance Task	Perform. Type	Learning Difficulty
1	SELECT MEDIA TO USE	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
2	SELECT METHOD OF DRAWING	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
3	DETERMINE SIZE OF SHEET	DISCRIMINATION	MODERATE, 3RD LEVEL OF COGNITIVE
4	DRAW FREEHAND DETAILS	MANIPULATION	MODERATE, 2ND LEVEL OF PSCHOMOT.
5			
6			
7			
8			
9			
10			
11			

Equipment: PENCILS, ERASERS, LEADS, LEAD HOLDERS, SKETCH OR TRACING PAPER, AND SHARPENER.

Figure 8. Performance Task Detailing of Makes Freehand Drawings Job Generated Performance Objectives.

JOB/TASK ANALYSIS

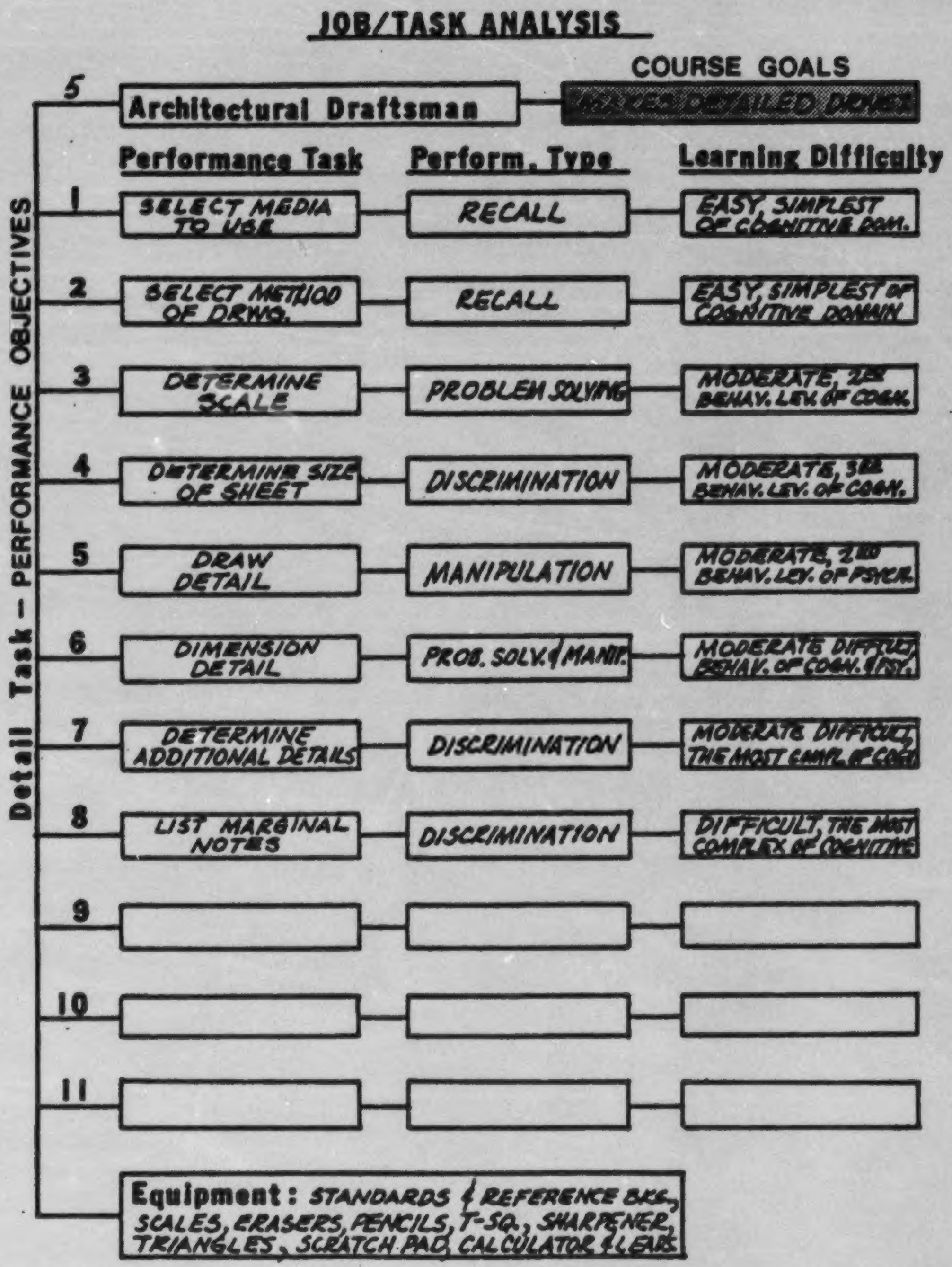
		COURSE GOALS
4	Architectural Draftsman	CHECKS DRAWINGS

Detail Task – PERFORMANCE OBJECTIVES

	Performance Task	Perform. Type	Learning Difficulty
1	REVIEW CHECK DRAWINGS	DISCRIMINATION	MODERATE, 3RD LEVEL OF COGNITIVE
2	DETERMINE INITIAL METHOD OF CHECK	PROBLEM SOLVING	MODERATE, 2ND LEVEL OF COGNITIVE
3	ARRANGE DRAWINGS IN SEQUENTIAL ORDER	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
4	CHECK DRAWINGS, SCALE AND DETAILS	PROB. SOLV./DISCRIM	DIFFICULT, MOST COMPLEX OF COGNIT
5	LIST CORRECTIONS ON DRAWINGS	PROBLEM SOLVING	MODERATE, 2ND LEVEL OF COGNITIVE.
6			
7			
8			
9			
10			
11			

Equipment: STANDARDS, REFERENCE BOOKS, DRAWING SCALES, MARKING PENCILS, SCRATCH PAD, AND CALCULATOR.

Figure 9. Performance Task Detailing of Checks Drawings Job Generated Performance Objectives.



JOB/TASK ANALYSIS

COURSE GOALS

5 Architectural Draftsman — MAKES DETAILED DRWGS.

Detail Task – PERFORMANCE OBJECTIVES

	Performance Task	Perform. Type	Learning Difficulty
1	SELECT MEDIA TO USE	RECALL	EASY, SIMPLEST OF COGNITIVE DOM.
2	SELECT METHOD OF DRWG.	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
3	DETERMINE SCALE	PROBLEM SOLVING	MODERATE, 2ND BEHAV. LEV. OF COGN.
4	DETERMINE SIZE OF SHEET	DISCRIMINATION	MODERATE, 3RD BEHAV. LEV. OF COGN.
5	DRAW DETAIL	MANIPULATION	MODERATE, 2ND BEHAV. LEV. OF PSYCH.
6	DIMENSION DETAIL	PROB. SOLV. & MANIP.	MODERATE DIFFICULT, BEHAV. OF COGN. & PSY.
7	DETERMINE ADDITIONAL DETAILS	DISCRIMINATION	MODERATE DIFFICULT, THE MOST COMPL. OF COGN.
8	LIST MARGINAL NOTES	DISCRIMINATION	DIFFICULT, THE MOST COMPLEX OF COGNITIVE
9			
10			
11			

Equipment: STANDARDS & REFERENCE BKS., SCALES, ERASERS, PENCILS, T-SQ., SHARPENER, TRIANGLES, SCRATCH PAD, CALCULATOR & LEADS

Figure 10. Performance Task Detailing of Makes Detailed Drawings Job Generated Performance Objectives.

JOB/TASK ANALYSIS

COURSE GOALS

6 **Architectural Draftsman** — MAKES DESIGN LAYOUTS

Detail Task – PERFORMANCE OBJECTIVES

	Performance Task	Perform. Type	Learning Difficulty
1	SELECT MEDIA TO USE	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
2	SELECT METHOD OF DRAWING	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
3	DETERMINE SCALE	PROBLEM SOLVING	MODERATE, 2ND LEVEL OF COGNITIVE
4	DETERMINE SIZE OF SHEET	DISCRIMINATION	MODERATE, 3RD LEVEL OF COGNITIVE
5	DETERMINE NUMBER OF LAYOUTS	DISCRIMINATION	DIFFICULT, THE MOST COMPLEX OF COGNITIVE
6	MAKE DESIGN LAYOUTS	MANIP. & PROB. SOLV.	MODERATE DIFFICULT. PSYCHOMOTOR & COGNIT.
7	DETERMINE NUMBER OF DETAILS	DISCRIMINATION	MODERATE DIFFICULT MOST COMPLEX COGNIT.
8			
9			
10			
11			

Equipment: STANDARDS AND REFERENCE BOOKS, DRAWING SCALES, PENCILS, T-SQUARE, TRIANGLES, TRACING PAPER, ERASERS AND LEADS

Figure 11. Performance Task Detailing of Makes Design Layouts Job Generated Performance Objectives.

JOB/TASK ANALYSIS

7 **Architectural Draftsman** — **COURSE GOALS**: DRAWS WORKING PLANS

Detail Task—PERFORMANCE OBJECTIVES

	Performance Task	**Perform. Type**	**Learning Difficulty**
1	SELECT MEDIA TO USE	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
2	SELECT METHOD OF DRAWING	RECALL	EASY, SIMPLEST OF COGNITIVE DOMAIN
3	DETERMINE SCALE	PROBLEM SOLVING	MODERATE, 2ND LEVEL OF COGNITIVE
4	DETERMINE SIZE OF SHEET	DISCRIMINATION	MODERATE, 3RD LEVEL OF PSYCHOMOT.
5	DETERMINE NUMBER OF PLANS	DISCRIMINATION	MODERATE DIFFICULT MOST COMPLEX COGNIT.
6	DETERMINE NUMBER OF DETAILS	DISCRIMINATION	DIFFICULT, THE MOST COMPLEX OF COGNITIVE
7	DRAW WORKING PLANS	MANIPULATION	MODERATE 2ND LEVEL OF PSYCHOMOT.
8	DIMENSION WORKING PLANS	PROB. SOLV. & MANIP.	MODERATE DIFFICU COGNITIVE & PSYCHOMO
9	DETERMINE ADDITIONAL DETAILS	DISCRIMINATION	DIFFICULT, THE MOST COMPLEX OF COGNITIVE
10	LIST MARGINAL NOTES	DISCRIMINATION	DIFFICULT THE MOST COMPLEX OF COGNITIVE
11			

Equipment: STANDARDS AND REFERENCE BOOKS, SCALES, ERASERS, PENCILS, T-SQUARE, SHARPENER, LEADS AND TRACING PAPER.

Figure 12. Performance Task Detailing of Draws Working Plans Job Generated Performance Objectives.

quency were identified for each task. They were organized into the cognitive, affective, and manipulated behaviors required to be mastered. The cognitive behaviors were found to be contained to a large extent in the architectural drafting tasks.

Each performance objective was supported by two or more learning activities which gave the student the means to master the terminal performance objective. These activities called, enabling objectives, included the behavior required for the continued learning process from the simple to the difficult, as did the performance objectives from the least important to the most important.

Objective-Referenced Testing

Objective-referenced testing was used to assess the needs of the student and the necessary behavior to master these needs. The result of the prerequisite test was used to assess the student's strengths. From this assessment, the instructor adjusted the learning activities to ensure mastery of the terminal performance objectives. The light commercial building drafting course required the mastery of residential drafting prior to entry. Therefore, the prerequisite skills test was designed with residential course behaviors in mind.

> The results of the prerequisite skills test enabled the instructor . . . to deal with this

> learner, as an individual, it is important for you to know if he has the prerequisite skills to enter your planned learning experience. If he/she does not have the prerequisite skills, he/she or you have some adjusting to do (Brown, 1975, p. 27).

This adjustment gave the course the flexibility required to individualize the instruction for the students' needs. A student who had not completed the residential drafting course could enter the light commercial drafting course by passage of the prerequisite test.

Objective-referenced testing was utilized to evaluate the learner's mastery of the terminal and enabling objectives called the exit test. Passage of the exit test allowed the student to enter the next task package and the instructor to know the level of achievement. The exit test was considered to be the measurement of the performance objective. It matched exactly the performance objectives required from the student for each task package.

The instructor also tested students prior to the entry into a task package by use of the exit test for that task package. Passage of the exit test allowed the student to proceed to the next performance objective task package.

Task Packages

The learning activities were accumulated into a sequential order of task packages. The task package units, a course syllabus containing a bulletin description, a course overview, program goals, course goals, performance objectives, texts, and references were organized into a performance-based ten unit course. This instructional program of light commercial building architectural drafting was the result of this field study in the Appendix.

CHAPTER IV

SUMMARY AND RECOMMENDATIONS

Summary

Hands-on drafting techniques within a team setting is inherent to the architectural drafting profession. The student's success was further ensured by a knowledge of light commercial building drafting. Therefore, the development of program goals and performance objectives were identified to support a light commercial drafting course in the community college and university architectural curricula.

The first procedure followed during the study was the utilization of a task analysis of the architectural drafting profession that was based on a review of literature. Typical jobs, their frequency and importance, were organized into goal statements. The tasks performed to achieve each job were categorized into performance objectives. The learning activities appropriate to support each of the objectives were then selected in the order of the taxonomy required of the student. These followed a sequential order similar to the actual construction of a building. It was important that the student recognized the significance of this logical order of building construction in a orthographic form.

The goal statements and performance objectives should help equip students with the appropriate knowledge (cognitive), attitude (affective), and skills (psychomotor) for success in a drafting profession. The entire learning process was designed to expose students to the normal atmosphere of the drafting office and the building industry. Even then, the light commercial drafting course was only one step in the student's understanding of the architectural field, but as W. James Popham (1972) aptly stated:

> It is devilishly hard to assess many of the more profound goals of education. But if we can make some progress toward doing so, then we shall surely reap dividends for education and the learner it should serve (p. 433).

Recommendations

The study of light commercial building drafting was judged necessary for a community college and university architectural technology curricula. Additional research was recommended to promote and enhance the course material by:

1. The preparation of a follow-up evaluation survey to be answered by those individuals that successfully completed the light commercial drafting course, whether they are on the job or in subsequent learning. This survey completed the continual circuit of the learning process into a closed-loop system. It would link the performance based objectives of an instruction program and provided the means for revisions and growth of the learning process.
2. The development of goal statements and performance objectives for other architectural technology courses such as solar energy, specifications, building codes, energy conservation, and drafting courses for public,

educational, institutional, governmental and industrial buildings.

3. The development of an architectural drafting cooperative work experience program with industry. This program provided the student with continuity of course work into the drafting profession. It promoted confidence and identified the students' need for additional skills.

4. The study of the affective and psychomotor learning behavior levels contained in architectural technology.

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APPENDIX

Performance-Based Light Commercial Drafting Course

ARCHITECTURE II - LIGHT COMMERCIAL DRAFTING COURSE
FOR
COMMUNITY COLLEGE
OR
UNIVERSITY
ARCHITECTURAL CURRICULA DRAFTING

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ARCHITECTURE II
LIGHT COMMERCIAL DRAFTING
CENTRAL MICHIGAN UNIVERSITY
COURSE SYLLABUS

1. **Bulletin Description**

Arch. II	Light Commercial Drafting	3 (2-2)
Course No.	Course Title	Credit Hrs.

Course Description

Development of the architectural drafting techniques, basic construction methods and materials, drawing details, and the planning for a light commercial building.

Course Prerequisites

1. Arch. I Residential Architectural Drafting
2. Passage of the Prerequisite Skills Test by scoring 85 percent or greater.

II **Course Overview**

This course was designed to provide the student with the drafting experience actually encountered in the architectural profession. Emphasis was placed on the sequential procedures followed in the planning, drawing and construction of a light commercial building. A set of working drawings for a light commercial building was required of each member of a drafting team composed of five to six students. The set of drawings included the plans necessary to build a commercial facility

III Program Goal

After mastery of the learning activities in Architecture II, Light Commercial Drafting, the student will possess the ability to successfully enter the architectural drafting profession for light commercial buildings or to continue with further education.

IV Course Goal

After mastery of the learning activities in Architecture II, Light Commercial Drafting, the student will possess the ability to:

1. Trace drawings of commercial buildings.
2. Sketch drawings of commercial buildings.
3. Make freehand drawings of commercial buildings.
4. Check drawings of commercial buildings.
5. Make detailed drawings of commercial buildings.
6. Make design layouts of commercial buildings.
7. Draw a set of working plans for a commercial building.

V Performance Objectives

Given the required textbook, learning activity task package, references, standards, specifications, transparencies, slides, lectures, field trips, guest speakers, and a drafting team setting, the student will demonstrate the following terminal performance objectives:

1. Site Plan (A-1)

   After completion of Task Package 1 - Site Plan, the learner will draw a site plan with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

2. Landscape Plan (A-2)

   After completion of Task Package 2 - Landscape Plan, the learner will draw a landscape plan with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit tests.

3. Basement and Foundation Plan (A-3)

   After completion of Task Package 3 - Basement and Foundation Plan, the learner will draw a basement and foundation plan with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

4. Floor Plan (A-4)

   After completion of Task Package 4 - Floor Plan, the learner will draw a floor plan with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

5. First Floor and Roof Framing Plan (A-5)

   After completion of Task Package 5 - First Floor and Roof Framing Plan, the learner will draw a floor and roof framing plan with the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

6. Building Elevations and Sections (A-6)

   After completion of Task Package 6 - Building Elevations and Sections, the learner will draw building elevations and sections with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

7. Details (A-7)

After completion of Task Package 7 - Details, the learner will draw details with all the necessary notes using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

8. Electrical Plan (E-1)

After completion of Task Package 8 - Electrical Plan, the learner will draw electrical plans for the basement and first floor with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

9. Mechanical Plan (M-1)

After completion of Task Package 9 - Mechanical Plan, the learner will draw mechanical plans for the basement and first floor with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

10. Plumbing Plan (P-1)

After completion of Task Package 10 - Plumbing Plan, the learner will draw plumbing plans for the basement and first floor with all the necessary details using the appropriate symbols and scale as evidenced through team demonstration and by scoring 85 percent on the exit test.

VI Required Textbook (Furnished by the student)

Spence, William P., Architecture - design, engineering, drawing, (3rd ed.), Bloomington, Illinois: McKnight Publishing Co., 1979.

VII Required Equipment and Materials (Furnished by the student)

Various drafting equipment, pencil holders, 24" x 36" (10) sheets of vellum, leads H, 2H, 3H and drafting instruments, as needed to prepare a set of working drawings for a light commercial building.

VIII Recommended References

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IX Student Evaluation

The final grade earned by the student was based on the successful completion of the performance objectives and the group project. The completed performance objectives comprised 85 percent and the drafting team group project comprised 15 percent of the student's grade. Each student in a particular group received the same grade of all members of that same group. The evaluation form contained in the Course Policy was designed to provide the student a guide for recording completed performance objectives and the grades received.

ARCHITECTURE II
LIGHT COMMERCIAL DRAFTING
FOR
COMMUNITY COLLEGE OR UNIVERSITY
COURSE POLICY
INTRODUCTION

The student had the individual experience of preparing a set of working drawings for a small project in the prerequisite Architecture I - Architecture Residential Drafting. The more complex light commercial drafting required the efforts of individuals working together in a drafting team. The team represented the normal process in the architectural profession even though an individual draftsman spends considerable alone time on the drawing board.

The first part of each task package familiarized the student with the individual terminology and enabling objectives necessary to master the terminal performance objective.

The second part addressed the student with the team drafting group consisting of five to six students. Assignment to each team was determined by the student's portfolio of sample work and the personal data sheet information.

The instructor will act as the project architect for each team to monitor, harmonize, and direct the group efforts. Each team will select a job captain from its members and a light commercial building project. The job captain will develop a flow chart of the activities (terminal performance objectives) to complete a set of working drawings. The flow chart included the tasks assigned to each member and the estimated time to complete each task for the total project. The instructor will furnish each team a sample set of prints of a light commercial building similar to the project selected by the team.

Each team will complete three tasks to demonstrate mastery of the course goals.

1. A set of working drawings from each member consisting of 10 sheets of pencil drawings on paper vellum.
2. Project Report - 5 pages typewritten summary of the light commercial building selected by the team.
3. Team presentation and class discussion of each team project.

LIGHT COMMERCIAL DRAFTING

PERSONAL DATA SHEET

(Instructor's Reference Only)

Name: ______________________________ Course: __________________

Today's Date: ____

Local Address: ____
Street City State Zip

Home Phone: ________________ Business Phone __________________

Major: _____________________ Minor: ___________________________

Classification/Level: ____

Institutions Previously Attended: _______________________________

Degree (s): ____

Work/Teaching Experience (last five years - with most recent listed first):

1.

2.

3.

4.

5.

State your personal/professional goals for three years from now:

State your personal/professional goals for ten years from now:

Special Information:

LIGHT COMMERCIAL DRAFTING

PREREQUISITE SKILLS TEST

STUDENT'S NAME ____

SCORE ____________________ DATE ______________________________

TIME 2 hours EQUIPMENT Supplied by Instructor

Prerequisite Skills Test

Prior to beginning work on this course the student is required to take the prerequisite skills test. The test results identify the student's needs and level of skills. This permits adjustment of the learning activities to ensure the student's mastery of the terminal objectives. The test is based on the skills assumed mastered in the previous residential architectural drafting course. The results of the test will not be used for the evaluation of the student's final grade.

Do you have any questions? If so, see your instructor for help. If not, go on to the Prerequisite Skills Test. Passage of 85 percent or more allows you to continue on to the learning activity task packages designed for this course. Below 85 percent requires remedial work and retest.

Points TRUE-FALSE QUESTIONS. Indicate T or F to correct statement

(1 pt.) 1. _____ Roof overhand shields the house from the winter sun rays.

(1 pt.) 2. _____ A pier is a masonry unit that supports a beam.

(1 pt.) 3. _____ Two common framing systems for houses are the balloon and platform framing systems.

(1 pt.) 4. _____ The most used metric measure in drawing plans is the centimeter.

(1 pt.) 5. _____ Heat pumps for residences are usually of the air type rather than water type.

(1 pt.) 6. _____ Vapor barriers are installed on the cold side of the wall.

(1 pt.) 7. _____ The major factor in residential conservation of energy is insulation.

(1 pt.) 8. _____ The most common solar collector for residences is the concentrating type.

Points **TRUE-FALSE QUESTIONS** (continued)

(1 pt.) 9. _____The heat pump can be used for the heating and cooling of buildings.

(1 pt.) 10. _____The frost line is the depth to which soil freezes.

(1 pt.) 11. _____A column is a wood post that supports a pilaster.

(1 pt.) 12. _____The minimum code requirement for glass area in residential work is 20 percent of the floor area in each room.

(1 pt.) 13. _____Live load is the weight of the materials used to construct the building.

(1 pt.) 14. _____The minimum clear headroom for a main stairway is 6 ft. 8 inches.

(1 pt.) 15. _____Crawl space and attic ventilation is used to remove warm air.

(1 pt.) 16. _____To prevent explosions, water heaters use pressure relief valves.

(1 pt.) 17. _____Heat loss calculations are used to determine the proper size of the cooling system.

(1 pt.) 18. _____A joist is a large horizontal beam.

(1 pt.) 19. _____A cornice supports the rafters at their upper ends.

(1 pt.) 20. _____R-value measures the resistance of material to heat flow.

Points **MATCHING**. Identify each item

(1 pt.) 21. _____Tread
(1 pt.) 22. _____Pitch
(1 pt.) 23. _____Lintel
(1 pt.) 24. _____Truss
(1 pt.) 25. _____Footing
(1 pt.) 26. _____Bridging

a. Horizontal door support
b. Concrete supporting pad
c. Preassembled unit of 2 rafters and 1 ceiling joist
d. Space heating device
e. Unit of heat flow
f. Horizontal stair portion
g. Rows of diagonal joist bracing
h. Weight of building materials
i. Supports ends of beams
j. Roof angle from ridge to plate
k. Refrigerator in reverse

Points MATCHING (continued) Identify each item.

(1 pt.) 27. _____BTUH

(1 pt.) 28. _____Pilaster

(1 pt.) 29. _____Dead Load

(1 pt.) 30. _____Convector

(1 pt.) 31. _____Heat Pump

Points MULTIPLE CHOICE. Indicate correct letter.

(2 pts.) 32. _____Septic tanks are usually placed (a) 30 ft., (b) 25 ft., (c) 150 ft., (d) 50 ft. from water wells.

(2 pts.) 33. _____The solar collector angle of tilt for heating is equal to degrees of latitude plus (a) 0 degrees, (b) 5 degrees, (c) 10 degrees (d) 15 degrees, (e) 25 degrees.

(2 pts.) 34. _____The clear distance between a chimney and wood framing is (a) 1 inch, (b) 2 inches, (c) 3 inches, (d) ½ inch.

(2 pts.) 35. _____The normal spacing for 2 x 4 studs in residential construction is (a) 12 inches, (b) 14 inches, (c) 16 inches, (d) 24 inches, (e) 18 inches.

(2 pts.) 36. _____The residential lighting load can be estimated by multiplying the square feet by (a) 4 watts, (b) 8 watts, (c) 10 watts, (d) 16 watts.

(2 pts.) 37. _____All weather wood foundation refers to (a) loadbearing wood frame, (b) below ground use of wood, (c) light frame construction, (d) all of the above, (e) none of the above.

(2 pts.) 38. _____The typical diameter cast-iron soil pipe used for residential is usually (a) 2 inches (b) 4 inches, (c) 6 inches, (d) 18 inches, (e) 10 inches.

(2 pts.) 39. _____The control of heat in each room is called (a) zone heat, (b) space heat, (c) central heat, (d) convector heat.

Points MULTIPLE CHOICE. (continued)

(2 pts.) 40. ____ The thickness-to-width ratio of a footing should be kept close to (a) 1 to 1, (b) 1 to 2, (c) 1 to 3, (d) 2 to 1, (e) 2 to 3.

(2 pts.) 41. ____ That part of the electrical system that brings power from the pole to the house is called the (a) service entrance, (b) power pole, (c) panel box, (d) house service.

Points COMPLETION. Fill in blanks with correct answers.

(2 pts.) 42. Columns are subject to two loading forces (a) ____________ and (b) ____________

(2 pts.) 43. The three types of residential electrical services are (a) ____________, (b) ____________, (c) ____________

(2 pts.) 44. The three (3) considerations for selecting the proper joist size are (a) ____________ (b) ____________, (c) ____________

(2 pts.) 45. The three (3) types of gas and oil forced-air systems are the (a) ____________, (b) ____________, (c) ____________

(2 pts.) 46. The two (2) common types of drain traps are the (a) ____________, (b) ____________

(2 pts.) 47. A typical solar system has three (3) components (a) ____________, (b) ____________ (c) ____________.

(2 pts.) 48. The advantage of a fireplace heatilater are that it (a) ____________ (b) ____________.

(2 pts.) 49. The five (5) major types of insulation are (a) ____________, (b) ____________ (c) ____________, (d) ____________ (e) ____________.

(2 pts.) 50. The three (3) most frequently used bond patterns for brick walls are (a) ____________ (b) ____________, (c) ____________

(2 pts.) 51. Two (2) of the most common kinds of horizontal wood siding are (a) ____________ (b) ____________.

Points DEFINE. Write on back of sheet if you need more space.

(3 pts.) 52. Fixture unit value is ______________________

(3 pts.) 53. Architectural symbols are ______________________

(3 pts.) 54 Specifications ______________________

(3 pts.) 55. Building code ______________________

(3 pts.) 56 Work triangle ______________________

(3 pts.) 57 Modular component ______________________

(3 pts.) 58. Loggia ______________________

(100 pts.) (85% or higher required for passage.)

B. Demonstrate the ability to prepare a set of residential working drawings by: (no points)

1. Submitting a portfolio of drawings and other examples that indicate your mastery of basic drafting skills necessary to achieve the performance objectives contained in the light commercial drafting course.
   The evaluation of this objective will be made by the instructor.

NOTE: Return the prerequisite skills test to the instructor for evaluation. Successful completion qualifies you to proceed to the light commercial drafting course, Task Package 1-Site Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

ANSWERS TO PREREQUISITE SKILLS TEST

TRUE-FALSE QUESTIONS

1. F, p. 104
2. T, p. 230
3. T, p. 170-71
4. F, p. 142
5. T, p. 328
6. F, p. professional experience
7. T, p. 306
8. F, p. 334
9. T, p. 325-27
10. T, p. 232
11. F, p. 230
12. F, p. 87
13. F, p. 228
14. T, p. 73
15. F, p. 311
16. T, p. 304
17. F, p. 342-46
18. F, p. 253
19. F, p. 180
20. T, p. 308

MATCHING

21. f, p. 72
22. i. p. 255
23. a, p. 272
24. c, p. 189
25. b, p. 225
26. g, p. 174
27. e, professional experience
28. i, p. 239
29. h, p. 228
30. d, p. 330
31. k, professional experience

MULTIPLE CHOICE

32. d, p. 302
33. d, p. 341
34. b, p. 173
35. c, p. 174
36. a, p. 281
37. d, p. 244-52
38. b, p. 294
39. b, p. 323
40. d, p. 226
41. a, p. 279

COMPLETION

42. (a) concentric (b) eccentric, p. 264-65.
43. (a) appliance (b) general purpose (c) special purpose p. 278-79.
44. (a) total load (b) kind of material (c) joist span, p. 253.
45. (a) downflow (b) upflow (c) horizontal, p. 319.
46. (a) P trap (b) drum trap, p. 300.
47. (a) collector (b) storage (c) distribution, p. 334.
48. (a) increases heat delivery (b) ease of masonry work, p. 349
49. (a) batts (b) blankets (c) foamed-in-place (d) loose (e) board, p. 307.

50. (a) common (b) flemish (c) english, p. 184.
51. (a) bevel (b) shiplap, p. 178.

DEFINE

52. Fixture unit value is the measurement of the flow of waste, (p. 298).
53. Architectural symbols are the representations of parts and materials used in construction drawings, (p. 131-38).
54. Specifications is the written form of the details that cannot be shown on the working drawings, (p. 131).
55. Building code specifies acceptable types of materials, construction methods, health, and safety requirements, (p. 102)
56. Work triangle is the total straight line distance from range to refrigerator to sink and back to range, (p. 41).
57. Modular component is a factory-assembled part of a building, (p. 196).
58. Loggia is the roofed open gallery along the front or side of a building, (p. 66).

NOTE: Page numbers refer to the textbook that is required for this course, William P. Spence, Architecture-Design, Engineering, Drawing. The instructor can assign these text pages to the student that needs remedial work.

LIGHT COMMERCIAL DRAFTING

COURSE OUTLINE

Task Pkg.	Terminal Performance Object	Text Pg.	Ref. A	Ref. B
A	Prerequisite Skills Test	---	---	---
1	Site Plan	383-84	1-58	87-125
2	Landscape Plan	105	---	107-119
3	Basement & Foundation Plan	385 & 396	126-46	87-125
4	Floor Plan	386	---	1-86
5	Floor & Roof Framing Plan	397 & 399	231-37	496-499
6	Bldg. Elevations & Sections	387 & 394	---	---
7	Details	391-400	Index	Index
8	Electrical Plan	401-402	348-60	633-641
9	Mechanical Plan	406-408	348-60	587-631
10	Plumbing Plan	403-405	348-60	592-613
B	Team Presentation	---	---	---

Text: Architecture-Design, Engineering, Drawing, by William P. Spence, 3rd edition, The McKnight Publishing Co., 1979.

Reference A: Methods and Materials of Commercial Construction, by Frank R. Dagostino, Reston Publishing Company, Inc., 1974.

Reference B: Architectural Graphic Standards, by Charles G. Ramsey and Harold R. Sleeper, 6th edition, John Wiley & Sons, Inc., 1970.

LIGHT COMMERCIAL DRAFTING

COURSE GRADE SHEET

STUDENT'S NAME________________________________DATE____________

Task Pkg.	Start Date	Task Package Terminal Perf. Object	Completion Date	Grade Points
A		Prerequisite Test		---
1		Site Plan		
2		Landscape Plan		
3		Basement & Found. Plan		
4		Floor Plan		
5		Fl. & Roof Framing Plan		
6		Bldgs. Elevs. & Sections		
7		Details		
8		Electrical Plan		
9		Mechanical Plan		
10		Plumbing Plan		
B		Team Presentation		
		Task Package Total Grade Points		
		Task Package Average Grade Points		

Instructor's Remarks:

1. Each task package is graded on a scale of 1-100
2. A = 95-100%, A- = 90-94%, B = 85-89%, B- = 80-84%, C = 75-79%, C- = 70-74%, D = 65-69%, D- = 60-64%, E = 59% or below.

FINAL GRADE 85% x Task Package Average
15% x Team Presentation
100% Final Grade

PROJECT REPORT

LIGHT COMMERCIAL DRAFTING

Project: ______________________________

Date: __________ Course Name: ____________________

Job Captain: ____________________________

Drafting Team

1. ________________ 4. ________________
2. ________________ 5. ________________
3. ________________ 6. ________________

Introduction:

Presentation: Main Body of Report

Recommendation:

Conclusion:

NOTE: The evaluation of the drafting team will be based on the clarity, completeness, and correctness of the presentation working drawings, and project report. All members of each team will receive the same grade which represents 15 percent of the student's final grade.

Learning Activity Package: This course is designed in a sequential order of ten (10) units in the same manner an architectural draftsperson prepares a set of working drawings. These units are called task packages and reflect the usual sequence of construction activities necessary to build a light commercial building. Each task package represents a terminal performance objective containing prerequisites, equipment, safety requirements, enabling objectives, terminology, learning activities, exit test, test answers, and references.

Terminal Performance Objective: The terminal performance objective is a statement of the behavioral outcome to be mastered by the student.

Enabling Objective: The enabling objective is a behavioral statement of a student's performance steps necessary to master the terminal performance objective.

Learning Activity: The learning activity outlines the steps to accomplish the enabling objectives.

Exit Test: The exit test assesses the student's mastery of the terminal performance objective after the learning process is complete.

Terminology: Architectural terms deemed necessary to master the unit objectives.

References: References are listed to give the student additional reading and examples in conjunction with the required textbook.

Time: The approximate time for a student to complete a terminal performance objective.

Equipment: The basic drafting equipment peculiar to the demonstration of the objectives.

Prerequisites: Prior to instruction, certain skills are necessary to achieve the terminal performance objective.

Safety Requirements: The students' safety is paramount to the performance of the learning activity in the classroom. This will carry the students' awareness of safety into the drafting profession.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

SITE PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a site plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent or greater on the exit test.

RATIONALE: The site plan sets the theme for the entire set of working drawings. It is the major plan required by Building Officials for approval to proceed with the project. It establishes the legal property lines, the property description, building zoning setbacks, the location of the building on the site, and the existing natural land contours. The site plan shows the conditions the contractor will be required to work. It indicates the drainage, the parking, streets, sidewalks, utilities, utility structures, soil test borings, existing and new site features, and general contract notes for the entire project. The site plan carries the index for the set of working drawings, list of abbreviations, material symbols, and is the main record drawing kept by the owner and the building authority.

TERMINOLOGY: Terms used in this Task Package to assist with the mastery of the terminal performance objective are: Bearing, Bench Mark, Contour, Datum, Easement, Grade, Invert, Setback, and Test Boring.

PREREQUISITES: Prerequisites skills test score of 85 percent or greater.

EQUIPMENT: Text--William P. Spence, Architecture--Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

SITE PLAN

PLACE: This Task Package can be accomplished in the drafting room and at home. The team work will be required to take place in the drafting room. The individual work will be required to take place on the students' own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the site plan.

2. Give a brief definition of the terminology related to this task package.

3. List the nine (9) major site features identified on the site plan.

4. State the two (2) general rules for site drainage.

5. List the three (3) types of parking layouts.

6. State the most economical parking stall size and driveway.

7. List the seven (7) basic elements of a site plan drawing.

8. Identify seven (7) errors commonly found on a site plan.

9. Demonstrate the ability to draw a site plan of a light commercial building at a scale of 1" = 30 ft. or as appropriate. (a) Demonstration shall take place in the drafting team setting.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

SITE PLAN

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figure 16-2 on page 384 in your textbook. Study site plan print, Sheet A-1, from the sample set of plans.

1. The site plan is important for four (4) reasons:
   (a) Locates building on the site.
   (b) Graphic representation of the contour slope of the site.
   (c) Legal document drawing for municipal governments.
   (d) Sets the scene for the contractor's operations.

2. Terms and definitions related to this task package:
   (a) Bearing - The horizontal direction of a property line.
   (b) Bench mark - A fixed reference point used to determine the various grades for construction purposes.
   (c) Contour - A line of connected points having the same elevations, p. 104.
   (d) Datum - A level surface to which elevations are referred, p. 104.
   (e) Easement - A designated portion of land for utility companies to place, service, or replace utilities, p. 103.
   (f) Grade - The ground elevation around a building, p. 104.
   (g) Invert - The lowest elevation level of a sewer line that the flow is determined.
   (h) Setback - The minimum distance from the front, rear and side building lines to the property line.
   (i) Test boring - A soil boring made at the location of the building to determine soil types, soil depths, and water table, pp. 495-496.

3. The nine (9) major site features identified on the site plan are: pp. 383-84.
   (a) Contours.
   (b) Bench mark.
   (c) Existing elevations.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

SITE PLAN

- (d) Proposed elevations.
- (e) Walks.
- (f) Curb and gutter.
- (g) Sewer inverts and drainage slope.
- (h) Proposed buildings.

4. The two (2) general rules of drainage are: pp. 103-04.
   - (a) Slope drainage away from buildings.
   - (b) Minimum slope of all surface drainage is 2 percent.

5. The three (3) major types of parking layouts: p. 457.
   - (a) 90 degree parking.
   - (b) 45 degree parking.
   - (c) Parallel parking.

6. The recommended economical parking layout is:
   - (a) 90 degree with a 9 ft. x 20 ft. stall and a 22 ft. driveway.

7. The seven (7) basic elements of the site plan drawing are: p. 382.
   - (a) List of abbreviations.
   - (b) Section symbols.
   - (c) Material indications.
   - (d) Index of drawings.
   - (e) Existing site conditions.
   - (f) Proposed building and site conditions.
   - (g) Parking lot details.

8. Seven (7) errors commonly found on site plans are:
   - (a) Improper building setbacks.
   - (b) Lack of positive drainage flow.
   - (c) Building located outside of property lines.
   - (d) North arrow missing or not orientated vertically on the sheet.
   - (e) All existing easements are not shown.
   - (f) Insufficient soils and water table investigations.

9. Demonstrate the ability to draw a site plan of a light commercial building: p. 384.
   - (a) Obtain a sheet 24" x 36" vellum paper.
   - (b) Draw a site plan for your assigned building.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

SITE PLAN

(1) The appropriate layout.
(2) The applicable scale.
(3) All necessary dimensions and details.
(4) The architectural symbols, p. 137.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

EXIT TEST--SITE PLAN

STUDENT'S NAME____

SCORE____________________ DATE____________________________

TIME 1 hour EQUIPMENT Supplied by instructor

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-1? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85% or more allows you to continue on to Task Package-2, Landscape Plan. Below 85% requires you to do remedial work and retest.

Points COMPLETION. Fill in the blanks.

(8 pts.) 1. List four (4) major reasons for the importance of the site plan.
(a)____________________________________
(b)____________________________________
(c)____________________________________
(d)____________________________________

(18 pts.) 2. Define the following terms.
(a) Bearing______________________________
(b) Bench mark___________________________
(c) Contour______________________________
(d) Datum_______________________________
(e) Easement_____________________________
(f) Grade_______________________________
(g) Invert______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

EXIT TEST--SITE PLAN

Points **Define.** (continued)

(h) Setback ______________________________
____

(i) Test boring ______________________________
____

(18 pts.) 3. List the nine (9) major site features identified on the site plan.
(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________
(h) ______________________________

(4 pts.) 4. State the two (2) general rules for site drainage.
(a) ______________________________
(b) ______________________________

(6 pts.) 5. List the three (3) types of parking layouts.
(a) ______________________________
(b) ______________________________
(c) ______________________________

(3 pts.) 6. State the most economical parking stall size and driveway.
(a) ______________________________

(14 pts.) 7. List the seven (7) basic elements of a site plan drawing.
(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

EXIT TEST--SITE PLAN

Points

(14 pts.) 8. Identify seven (7) common errors found on a site plan.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________

(15 pts.) 9. Demonstrate the ability to draw a site plan of a light commercial building and include:

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The architectural symbols.

(100 pts.) (85% or higher required for passage.)

Note: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-2--Landscape Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

ANSWERS TO EXIT TEST--SITE PLAN

1. (a) Locates building on the site.
   (b) Graphic representation of the contour slope of the site.
   (c) Legal document drawing for municipal governments.
   (d) Sets the scene for the contractor's operations.

2. (a) Bearing - The horizontal direction of a property line.
   (b) Bench mark - A fixed reference point used to determine the various grades for construction purposes.
   (c) Contour - A line of connected points having the same elevations.
   (d) Datum - A level surface to which elevations are referred.
   (e) Easement - A designated portion of land for utility companies to place, service, or replace utilities.
   (f) Grade - The ground elevation around a building.
   (g) Invert - The lowest elevation level of a sewer line that the flow is determined.
   (h) Setback - The minimum distance from the front, rear and side building lines to the property line.
   (i) Test boring - A soil boring made at the location of the building to determine soil types, soil depths, and water table.

3. (a) Contours.
   (b) Bench mark.
   (c) Existing elevations.
   (d) Proposed elevations
   (e) Walks.
   (f) Curb and gutter.
   (g) Sewer inverts and drainage slope.
   (h) Proposed buildings.

4. (a) Slope drainage away from buildings.
   (b) Minimum slope of all surface drainage is 2%.

5. (a) 90 degree parking.
   (b) 45 degree parking.
   (c) Parallel parking.

6. (a) 90 degree with a 9 ft. x 20 ft. stall and a 22 ft. driveway.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-1

ANSWERS TO EXIT TEST--SITE PLAN

7. (a) List of abbreviations.
   (b) Section symbols.
   (c) Material indications.
   (d) Index of drawings.
   (e) Existing site conditions.
   (f) Proposed building and site conditions.
   (g) Parking lot details.

8. (a) Improper building setbacks.
   (b) Lack of positive drainage flow.
   (c) Building located outside the property line.
   (d) North arrow missing or not orientated vertically up on the sheet.
   (e) All existing easements are not shown.
   (f) Insufficient soils and water table investigations.

9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted site plan, sheet A-1.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

LANDSCAPE PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a landscape plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The landscape plan provides the environmental setting for the light commercial building. It shows buildings, roads, and vegetation, both existing and proposed. The landscape plan complements the design parameters of the building by superimposing the new contours onto the existing. The landscape materials express the overall design of the building, conforms to the level of adjoining land, and orientates the landscape and building to take advantage of energy, sun, and prevailing winds. The landscape influences the inhabitants of the building by improving the physical environment functionally and aesthetically. The plan indicates species and planting details.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: deciduous, coniferous, altitude, azimuth, orientation, prevailing, annual, perennial, ecology, mulch and greenbelt.

PREREQUISITES: Task Package-1 exit test score of 85 percent or greater.

EQUIPMENT: Text--William P. Spence, Architecture--Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting work will be required to take place on the student

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

LANDSCAPE PLAN

own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the landscape plan.
2. Give a brief definition of the terminology related to this task package.
3. List eight (8) major landscape features identified on the landscape plan.
4. List the eight (8) factors considered in the landscape design site analysis.
5. State the two (2) major approaches to landscape design.
6. List the four (4) special steps for a successful landscape plan.
7. List the five (5) basic elements of the landscape plan.
8. Identify eight (8) errors commonly found on a landscape plan.
9. Demonstrate the ability to draw a landscape plan of a light commercial building at the appropriate scale.
    (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

LANDSCAPE PLAN

B. Study figure 4-21 on page 105 in your textbook. Study the landscape plan print, Sheet A-2 from the sample set of plans.

1. The landscape plan is important for:
   - (a) Landscape plant materials provide a transition from the man-made architectural elements to a natural setting.
   - (b) Softens the visual effects of the structure.
   - (c) Assists the ecology to temper the temperature, and to reduce air and noise pollution.
   - (d) Provides the natural elements to conserve energy.

2. Terms and definitions related to this task package:
   - (a) Deciduous - Trees that shed leaves during winter.
   - (b) Coniferous - Trees that maintain their needles year around.
   - (c) Altitude - The angle of the sun to the earth, p. 100.
   - (d) Azimuth - The angle of inclination of the earth axis and the direction from which the sun rises and sets, p 107.
   - (e) Orientation - The positioning of the building on the set.
   - (f) Prevailing - The direction from which the winds normally blow during certain seasons.
   - (g) Annual - Plants and shrubs that have only a one year growing cycle.
   - (h) Perennial - Plants and trees that grow and bloom year after year.
   - (i) Ecology - Biological study of the relationship of man and his total environment.
   - (j) Mulch - Organic material placed at the base of plantings to protect from weeds, erosion and evaporation.
   - (k) Greenbelt - Green corridor of plantings separating functional areas.

3. The eight (8) major landscape features identified on the landscape plan are:
   - (a) Existing landscape materials and features to re-

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

LANDSCAPE PLAN

main.
- (b) Proposed new landscape materials including dimensions.
- (c) Legend of landscape symbols.
- (d) Plant list of landscape materials, quantities, sizes, common names and botanical names.
- (e) Underground utilities.
- (f) Buildings, roads, sidewalks and paths.
- (g) Contours, lawn and mulched areas.
- (h) Landscape planting details and related section

4. The landscape design site analysis requires the consideration of eight (8) factors:
   - (a) Climate and environmental conditions.
   - (b) Type of soil and maintenance.
   - (c) Use of native species of plant materials.
   - (d) Landscape materials that add to the aesthetic value of the building design.
   - (e) Preservation of existing trees on the site.
   - (f) Development of grading plans.
   - (g) Placement of buildings on site.
   - (h) Mass landscape composition for emphasis, form and color.

5. The two (2) major approaches to landscape design
   - (a) The naturalistic approach.
   - (b) The formal approach.

6. The success of the landscape plan depends on four (4) special steps:
   - (a) Consideration of the people served.
   - (b) Plant selection.
   - (c) Plant arrangement.
   - (d) Plant texture.

7. The five (5) basic elements of the landscape plan are:
   - (a) Planting key.
   - (b) Plant list.
   - (c) Plant detail and sections.
   - (d) Dimensions of plant spacing.
   - (e) Proposed building, plant, road and sidewalk layout.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

LANDSCAPE PLAN

8. The eight (8) errors commonly found on landscape plans are:
   - (a) Improper plant spacing.
   - (b) Improper soil for type of plant material specified.
   - (c) Lack of consideration for maintenance capabilities, problems and snow plowing.
   - (d) The wrong botanical name for a common species.
   - (e) Planting of landscape material that clog foundation drains, or shed messy fruits near building entrances.
   - (f) Landscape layout that does not meet municipal codes for spacing and quantity.
   - (g) The number of trees shown differing from the plant list quantity.
   - (h) The lack of sufficient planting details to execute the designer's plan.

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw a landscape plan of a light commercial building.
   - (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
   - (b) Turn to Sheet A-2 of the sample blueprints.
   - (c) Draw a landscape plan for your assigned building including:
     - (1) The appropriate layout.
     - (2) The applicable scale.
     - (3) All necessary dimensions and details.
     - (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

EXIT TEST - LANDSCAPE PLAN

STUDENT' NAME ________________________________

SCORE ______________ DATE ______________

TIME 1 hour EQUIPMENT Supplied by instructor

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-2? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85% or more allows you to continue on to Task Package-3 - Basement and Foundation Plan. Below 85% requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(8 pts.) 1. List four (4) major reasons for the importance of the landscape plan.

(a) ________________________________

(b) ________________________________

(c) ________________________________

(d) ________________________________

(11 pts.) 2. Define the following terms:

(a) Deciduous ________________________________

(b) Coniferous ________________________________

(c) Altitude ________________________________

(d) Azimuth ________________________________

(e) Orientation ________________________________

(f) Prevailing ________________________________

(g) Annual ________________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

EXIT TEST - LANDSCAPE PLAN

(h) Perennial____________________

(i) Ecology____________________

(j) Mulch____________________

(k) Greenbelt____________________

(16 pts.) 3. List the eight (8) major landscape features identified on the landscape plan.

(a)____________________
(b)____________________
(c)____________________
(d)____________________
(e)____________________
(f)____________________
(g)____________________
(h)____________________

(16 pts.) 4. List the eight (8) factors considered in the landscape design site analysis.

(a)____________________
(b)____________________
(c)____________________
(d)____________________
(e)____________________
(f)____________________
(g)____________________
(h)____________________

(4 pts.) 5. State the two (2) major approaches to landscape design.

(a)____________________
(b)____________________

(4 pts.) 6. List the four (4) special steps for a successful landscape plan.

(a)____________________
(b)____________________
(c)____________________
(d)____________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

EXIT TEST - LANDSCAPE PLAN

(10 pts.) 7. List the five (5) basic elements of the landscape plan.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________

(16 pts.) 8. Identify eight (8) common errors found on a landscape plan.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________
(h) ______________________________

(15 pts.) 9. Demonstrate the ability to draw a landscape plan of a light commercial building and include:

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The architectural symbols.

(85% or higher required for passage

(100 pts.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-3 - Basement and Foundation Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

ANSWERS TO EXIT TEST - LANDSCAPE PLAN

1. (a) Landscape plant materials provide a transition from the man-made architectural elements to a natural setting.
   (b) Softens the visual effects of the structure.
   (c) Assists the ecology to temper the temperature, and to reduce air and noise pollution.
   (d) Provides the natural elements to conserve energy.

2. (a) Deciderous - Trees that shed leaves during winter.
   (b) Coniferous - Trees that maintain their needles year round.
   (c) Altitude - The angle of the sun to the earth (p. 108).
   (d) Azimuth - The angle of inclination of the earth axis and the direction from which the sun rises and sets.
   (e) Orientation - The positioning of the building on the site.
   (f) Prevailing - The direction from which the winds normally blow during certain seasons (p. 106).
   (g) Annual - Plants and shrubs that have only a one year growing cycle.
   (h) Perennial - Plants and trees that grown and bloom year after year.
   (i) Ecology - Biological study of the relationship of man and his total environment.
   (j) Mulch - Organic material placed at the base of plantings to protect from weeds, erosion and evaporation.
   (k) Greenbelt - Green corridor of plantings separating functional areas.

3. (a) Existing landscape materials and features to remain.
   (b) Proposed new landscape materials and features to remain.
   (c) Legend of landscape symbols.
   (d) Plant list of landscape materials, quantities, sizes common names, and botanical names.
   (e) Underground utilities.
   (f) Buildings, roads, sidewalks and paths.
   (g) Contours, lawn and mulched areas.
   (h) Landscape planting details and related sections.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-2

ANSWERS TO EXIT TEST - LANDSCAPE PLAN

4. (a) Climate and environmental conditions.
   (b) Type of soil and maintenance.
   (c) Use of native species of plant materials.
   (d) Landscape materials that add to the aesthetic value of the building design.
   (e) Preservation of existing trees on the site.
   (f) Development of grading plans.
   (g) Placement of building on site.
   (h) Mass landscape composition for emphasis, form, and color.

5. (a) The naturalistic approach.
   (b) The formal approach.

6. (a) Consideration of the people served.
   (b) Plant selection.
   (c) Plant arrangement.
   (d) Plant texture.

7. (a) Planting key.
   (b) Plant list.
   (c) Plant details and sections.
   (d) Dimensions of plant spacing.
   (e) Proposed building, plant, road, and sidewalk layout.

8. (a) Improper plant spacing.
   (b) Improper soil for type of plant material specified.
   (c) Lack of consideration for maintenance capabilities, problems and snow plowing.
   (d) The wrong botanical name for a common species.
   (e) Planting of landscape material that clogs foundation drains or sheds messy fruit near building entrances.
   (f) Landscape layout that doesn't meet municipal codes for spacing and quantity.
   (g) The number of trees shown differing from the plant list quantity.
   (h) The lack of sufficient planting details to execute the designer's plan.

9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted landscape plan Sheet A-2.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

BASEMENT AND FOUNDATION PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a basement and foundation plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The basement and foundation plan provide the information to support the structure necessary to carry the upper floors. These two plans can be combined if both are simple in content and details. With the combined foundation and basement plans, the portion of foundation below the basement is shown by a hidden view dashed line. The portion of the plan above the basement floor slab is shown by a solid line. This plan also shows the first floor framing, structural columns, reinforcing steel in walls and slabs, steel beams, foundation drainage and functional areas. The foundation and basement plans refelect the base skeletal form upon which the building shown in the site plan is evolved. Needless to say, the importance of the foundation plan cannot be over emphasized because of its ability to add the required support network.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: pier, tamped, stepped footing, unexcavated, compaction, column, footing, continuous, pilaster, and foundation.

PREREQUISITES: Task Package-2 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, *Architecture--Design, Engineering, Drawing*, engineer scale, architect scale, eraser shield, leads (H, 2H and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plan provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

BASEMENT AND FOUNDATION PLAN

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the basement and foundation plan.

2. Give a brief definition of the terminology related to this task package.

3. List the six (6) major features identified on the basement and foundation plan.

4. State the four (4) general rules for a basement and foundation plan.

5. Name the five (5) major types of footings.

6. Name the two (2) loading conditions on footings.

7. List the six (6) basic elements of the basement and foundation plan.

8. Identify eight (8) errors commonly found on a basement and foundation plan.

9. Demonstrate the ability to draw the basement and foundation plan of a light commercial building at the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

BASEMENT AND FOUNDATION PLAN

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16.4 and 16.25 on page 385 and 396 respectively in your textbook. Study the basement and foundation plan print, Sheet A-3 from the sample set of plans.

1. The basement and foundation plan are important for three (3) reasons:
   - (a) Shows the proposed areas contained in the basement.
   - (b) Provides the structural support information for the building.
   - (c) Indicates the details necessary for the construction of the foundation according to the designed capacities.
2. Terms and definitions related to this task package:
   - (a) Pier - A masonry support foundation, pp. 230, 231, 236 and 237.
   - (b) Tamped - Sand fill that is forced down to eliminate settlement.
   - (c) Stepped footing - Building support that connect a lower foundation with a higher foundation, p. 226.
   - (d) Unexcavated - Areas shown on the plan that are not disturbed.
   - (e) Compaction - Required soil strength to lend the necessary support for floor slabs and foundation.
   - (f) Column - An individual support member, usually wood or metal.
   - (g) Footing - Foundation, wall, column, or pier support, p. 225.
   - (h) Continuous - A typical footing that runs the length of a foundation.
   - (i) Pilaster - A rectangular support projection from a foundation wall, p. 235.
   - (j) Foundation - The underground support system for a building structure.

3. The six (6) major building features identified on the basement and foundation plan are:

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

BASEMENT AND FOUNDATION PLAN

- (a) Footings.
- (b) Foundations.
- (c) Structural system for basement and first floor.
- (d) Floor slabs.
- (e) Basement areas and floor plan.
- (f) Footing drainage.

4. The four (4) general rules for basement and foundation plans are:
   - (a) Ensure proper soil conditions are available.
   - (b) Ensure that foundations are provided with sufficient drainage.
   - (c) Structural members designed with adequate capacity.
   - (d) Compacted sand fill provided under all slabs and foundations.
5. The five (5) major types of footings are:
   - (a) Rectangular footings, p. 225.
   - (b) Flared footings, p. 226.
   - (c) Stepped footings, p. 226.
   - (d) Pier footings, p. 226
   - (e) Column footings, p. 226.
6. The two (2) loading conditions on footings consist of:
   - (a) Dead loads - the weight of the building materials supported, p. 228.
   - (b) Live loads - the imposed weight of furnishings, equipment and people.
7. The six (6) basic elements of the basement and foundation plans are:
   - (a) The basement floor plan.
   - (b) The material indications.
   - (c) Foundation, footing and structural details.
   - (d) Floor, wall, and footing thickness.
   - (e) Structural sizes and members.
   - (f) Basement and foundation construction.
8. Eight (8) errors commonly found on basement and foundation plans are:
   - (a) Insufficient soil capacity to support footings and slabs.
   - (b) Improper design of structural foundations, footings and members.
   - (c) Lack of footing foundation drainage tile.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

BASEMENT AND FOUNDATION PLAN

(d) Insufficient details for construction of designed structural.
(e) Lack of insulation, waterproofing, and engineered backfill.
(f) Lack of testing the soils, concrete strength, and steel strength welds.
(g) Lack of thorough field inspection of steel spacing and size.
(h) North arrow missing or not orientated vertically on the sheet.

9. Demonstrate the ability to draw the basement and foundation plan of a light commercial building.
   (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
   (b) Turn to Sheet A-3 of the sample blueprints.
   (c) Draw a basement and foundation plan for your assigned building including:
      (1) The appropriate layout.
      (2) The applicable scale.
      (3) All necessary dimensions and details.
      (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

EXIT TEST - BASEMENT AND FOUNDATION PLAN

STUDENT'S NAME ______________________________

SCORE ________________ DATE ________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-3? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-4 - Floor Plan. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(9 pts.) 1. List three (3) major reasons for the importance of the basement and foundation plan.

(a) ______________________________

(b) ______________________________

(c) ______________________________

(10 pts.) 2. Define the following terms:

(a) Pier ______________________________

(b) Tamped ______________________________

(c) Stepped Footing ______________________________

(d) Unexcavated ______________________________

(e) Compaction ______________________________

(f) Column ______________________________

(g) Footing ______________________________

(h) Continuous ______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

EXIT TEST - BASEMENT AND FOUNDATION PLAN

Points COMPLETION. Fill in blanks with correct answers.

(i) Pilaster ______________________________
____

(j) Foundation ______________________________
____

(12 pts.) 3. List the six (6) major features identified on the basement and foundation plan.
(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________

(8 pts.) 4. State the four (4) general rules for a basement and foundation plan.
(a) ______________________________
____
(b) ______________________________
____
(c) ______________________________
____
(d) ______________________________
____

(10 pts.) 5. Name the five (5) major types of footings.
(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________

(8 pts.) 6. Name the two (2) loading conditions on footings.
(a) ______________________________
(b) ______________________________

(12 pts.) 7. List the six (6) basic elements of the basement and foundation plan.
(a) ______________________________
(b) ______________________________
(c) ______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

EXIT TEST - BASEMENT AND FOUNDATION PLAN

Points

(d) ________________________________
(e) ________________________________
(f) ________________________________

(16 pts.) 8. Identify eight (8) errors commonly found on a basement and foundation plan.
(a) ________________________________
____
(b) ________________________________
____
(c) ________________________________
____
(d) ________________________________
____
(e) ________________________________
____
(f) ________________________________
____
(g) ________________________________
____
(h) ________________________________
____

(15 pts.) 9. Demonstrate the ability to draw a basement and foundation plan of a light commercial building and include:
(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The architectural symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-4, Floor Plan.

CONGRATULATIONS!!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

ANSWERS TO EXIT TEST - BASEMENT AND FOUNDATION PLAN

1. (a) Shows the proposed areas contained in the basement.
   (b) Provides the structural support information for the building.
   (c) Indicates the details necessary for the construction of the foundation according to the designed capacities.

2. (a) Pier - A masonry support foundation.
   (b) Tamped - Sand fill that is forced down to eliminate settlement.
   (c) Stepped Footing - Building support that connects a lower foundation with a higher foundation.
   (d) Unexcavated - Areas shown on the plan that are not disturbed.
   (e) Compaction - Required soil strength to lend the necessary support for floor slabs and foundations.
   (f) Column - An individual support member, usually wood or metal.
   (g) Footing - Foundation, wall, column, or pier support.
   (h) Continuous - A typical footing that runs the full length of a foundation.
   (i) Pilaster - A rectangular support projection from a foundation wall.
   (j) Foundation - The underground support system for a building structure.

3. (a) Footings.
   (b) Foundations.
   (c) Structural system for basement and first floor.
   (d) Floor slabs.
   (e) Basement areas and floor plan.
   (f) Footing drainage.

4. (a) Ensure proper soil conditions are available.
   (b) Ensure that foundations are provided with sufficient drainage.
   (c) Structural members designed with adequate capacity.
   (d) Compacted sand fill provided under all slabs and foundations.

5. (a) Rectangular footings.
   (b) Flared footings.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-3

ANSWERS TO EXIT TEST - BASEMENT AND FOUNDATION PLAN

5. (c) Stepped footings.
   (d) Pier footings.
   (e) Column footings.

6. (a) Dead loads - The weight of the building materials supported.
   (b) Live loads - the imposed weight of furnishings, equipment, and people.

7. (a) The basement floor plan.
   (b) The material indications.
   (c) Foundation, footing and structural details.
   (d) Floor, wall, and footing thickness.
   (e) Structural sizes and members.
   (f) Basement and foundation construction.

8. (a) Insufficient soil capacity to support footings and slabs.
   (b) Improper design of structural foundations, footings and members.
   (c) Lack of footing foundation drainage tile.
   (d) Insufficient details for construction of designed structural.
   (e) Lack of insulation, waterproofing and engineered fill.
   (f) Lack of testing the soil, concrete, strength, and steel strength welds.
   (g) Lack of thorough field inspection of steel spacing and size.
   (h) North arrow missing or not orientated vertically on the sheet.

9. Team Learning Activity performance will be evaluated by the instructor in accordance with the student's submitted basement and foundation plan, Sheet A-3.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

FLOOR PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a floor plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The floor plan indicates the interior arrangement of functions. Each function carries on particular activity characteristic of the facility. In this case, the light commercial building type includes all sorts of small businesses, shops, retail stores, and service orientated facilities. The floor plan distinguishes the activity housed and fulfills the owner's requirements to be performed by the building. It is the one thing that allows the building to fulfill the need for which it is designed. It is also the most important ingredient that is most overlooked by designers which forms the base for all the working drawings. The floor plan gives all room dimensions, numbers and names of functions, type of materials, section lines, detail indications, and room finish schedule.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: control joint, masonry opening, foyer, centerlines, floor plan, ceiling joists, dimensions, section N.I.C., and wainscot.

PREREQUISITES: Task Package-3 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, Architecture-Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointer, triangles, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting will be required to take place on the students' own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the floor plan.

2. Give a brief definition of the terminology related to this task package.

3. List the seven (7) major features identified on the floor plan.

4. Name the two (2) types of section lines.

5. Identify the three (3) items required for detail indications.

6. List the nine (9) items contained on the room finish schedule.

7. List six (6) major considerations for handicapped compliance.

8. Identify seven (7) errors commonly found on the floor plan.

9. Demonstrate the ability to draw the floor plan of a light commercial building at a scale of ¼" = 1 ft. or as appropriate. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

FLOOR PLAN

B. Study figure 16.6 on page 386 in your textbook. Study the floor print, Sheet A-4, from the sample set of plans.

1. The floor plan is important for three (3) reasons: p. 382.
    - (a) Identifies the functions of the building activity.
    - (b) Forms the base document for all working drawings.
    - (c) Fulfills the owner's building requirements in graphic representation.
2. Terms and definitions related to this task package.
    - (a) Control joint - Provides vertical separation in masonry block walls to accommodate movement.
    - (b) Masonry opening - The sides of openings in masonry walls that are used to locate the dimensioning of windows and doors, p. 140.
    - (c) Foyer - The front entrance way to a building that acts as the principle introduction to the other functions of the building.
    - (d) Centerlines - The center of openings in frame construction use to locate the dimensioning of windows and doors, p. 140.
    - (e) Floor plan - Graphic representation of a horizontal cross section of a building five (5) feet above the floor line.
    - (f) Ceiling joists - Ceiling support system indicated on the floor plan.
    - (g) Dimensions - Method of indicating the true size of the building and details, p. 138-139.
    - (h) Sections - Graphic representation of a cut portion through a building, p. 149.
    - (i) N.I.C. - Items indicated on the plans that are "not in the contract" and are to be provided separately by the owner.
    - (j) Wainscot - The lower 40 inch portion of wall.
3. The seven (7) major features on the floor plan are: p. 386.
    - (a) Room names and numbers.
    - (b) Room dimensions.
    - (c) Type of materials.
    - (d) Section lines.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

FLOOR PLAN

- (e) Door numbers.
- (f) Detail indications.
- (g) Room finish schedule.

4. The two (2) types of section lines are, p. 149:
   - (a) Transverse section.
   - (b) Longitudinal section.
5. The three (3) items required for detail indications, p. 150-151.
   - (a) Detail number.
   - (b) Sheet number where detail is identified.
   - (c) Sheet number where detail is shown in expanded views.
6. The nine (9) items contained on the room finish schedule, p. 389.
   - (a) Room name.
   - (b) Room number.
   - (c) Floor material and finish.
   - (d) Base material and finish.
   - (e) Wainscot material, height, and finish.
   - (f) Wall material and finish.
   - (g) Ceiling height.
   - (h) Ceiling material and finish.
   - (i) Remarks.
7. Six (6) major considerations for handicapped compliances.
   - (a) Maximum threshold height of 3/4".
   - (b) One (1) handicapped parking space for every 25 parking stalls.
   - (c) Proper number of handicapped facilities in compliance to code.
   - (d) Curb cuts and sidewalk ramps, minimum width four (4) feet and maximum slope of 1 in 12.
   - (e) Proper height of light switches, toilet facilities, thermostats, and door knobs.
   - (f) Minimum clear opening door width of thirty-two (32) inches.
8. Seven (7) errors commonly found on floor plan are, p. 386:
   - (a) Improper orientation of functions for type of facility.
   - (b) Insufficient dimensions.
   - (c) Lack of adequate number of details and sections.

LIGHT COMMERCIAL DRAFTING
TASK PACKAGE-4

FLOOR PLAN

(d) All required data for good construction practices not shown.
(e) Noncompliance of building, handicapped and fire codes.
(f) Lack of consideration to orientation of building functions for solar and prevailing wind benefits.
(g) Insufficient structural member capacity calculations for proper design of the building.

9. Demonstrate the ability to draw a floor plan of a light commercial building.
    (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
    (b) Turn to Sheet A-4 of the sample blueprints.
    (c) Draw a floor plan for your assigned building including:
        (1) The appropriate layout.
        (2) The applicable scale.
        (3) All necessary dimensions and details.
        (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

EXIT TEST - FLOOR PLAN

STUDENT'S NAME ____________________

SCORE __________ DATE ________________

TIME 1 hour EQUIPMENT Supplied by instructor

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-4? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-5, Floor Plan. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answer.

(6 pts.) 1. List three (3) major reasons for the importance of the floor plan.

(a) ____________________

(b) ____________________

(c) ____________________

(20 pts.) 2. Define the following terms:

(a) Control joint ________________

(b) Masonry opening ________________

(c) Foyer ________________

(d) Centerline ________________

(e) Floor plan ________________

(f) Ceiling joists ________________

(g) Dimensions ________________

(h) Sections ________________

(i) N.I.C. ________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

EXIT TEST - FLOOR PLAN

Points

(j) Wainscot ____________________

(14 pts.) 3. List the seven (7) major features identified on the floor plan.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________

(4 pts.) 4. Name the two (2) types of section lines.

(a) ____________________
(b) ____________________

(3 pts.) 5. Identify the three (3) items required for detail indications.

(a) ____________________
(b) ____________________
(c) ____________________

(18 pts.) 6. List the nine (9) items contained on the room finish schedule.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________
(i) ____________________

(6 pts.) 7. List six (6) major considerations for handicapped compliance.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

ANSWERS TO EXIT TEST - FLOOR PLAN

1. (a) Identifies the functions of the building activity.
   (b) Forms the base document for all working drawings.
   (c) Fulfills the owner's building requirements in graphic representation.
2. (a) Control joint - Provides vertical separation in masonry block walls to accommodate movement.
   (b) Masonry opening - The sides of openings in masonry walls are used to locate the dimensioning of windows and doors.
   (c) Foyer - The front entrance way to a building that acts as the principle to the other functions of the building.
   (d) Centerlines - The center of openings in frame construction used to locate the dimensioning of windows and doors.
   (e) Floor plan - Graphic representation of a horizontal cross section of a building five (5) feet above the floor line.
   (f) Ceiling joists - Ceiling support system indicated on the floor plan.
   (g) Dimensions - Method of indicating the true size of the building and details.
   (h) Sections - Graphic representation of a cut portion through a building.
   (i) N.I.C. - Items indicated on the plans that are "not in the contract" and are to be provided separately by the owner.
   (j) Wainscot - The lower forty (40) inch portion of wall.
3. (a) Room names and numbers.
   (b) Room dimensions.
   (c) Type of materials.
   (d) Section lines.
   (e) Door numbers.
   (f) Detail indications.
   (g) Room finish schedule.
4. (a) Transverse section
   (b) Longitudinal section.
5. (a) Detail number.
   (b) Sheet number where detail is identified.
   (c) Sheet number where detail is shown in expanded views.
6. (a) Room name.
   (b) Room number.
   (c) Floor material and finish.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

ANSWERS TO EXIT TEST - FLOOR PLAN

6. (d) Base material and finish.
   (e) Wainscot material, height, and finish.
   (f) Wall material and finish.
   (g) Ceiling material and finish.
   (h) Ceiling heights.
   (i) Remarks.
7. (a) Maximum threshold height of 3/4 inch.
   (b) One (1) handicapped parking space for every 25 parking stalls.
   (c) Proper number of handicapped facilities in compliance of code.
   (d) Curb cuts and sidewalk ramps, minimum width four feet and maximum slope of 1 in 12.
   (e) Proper height of light switches, toilet facilities, thermostats, and door knobs.
   (f) Minimum clear opening door width of thirty-two (32) inches.
8. (a) Improper orientation of functions for type of facility.
   (b) Insufficient dimensions.
   (c) Lack of adequate number of details and sections.
   (d) All required data for good construction practices not shown.
   (e) Noncompliance of building, handicapped and fire codes.
   (f) Lack of consideration to orientation of building functions for solar and prevailing wind benefits.
   (g) Insufficient structural member capacity calculations for proper design of the building.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted floor plan Sheet A-4.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-4

EXIT TEST - FLOOR PLAN

Points

(14 pts.) 8. Identify seven (7) errors commonly found on the floor plan.

(a) ____

(b) ____

(c) ____

(d) ____

(e) ____

(f) ____

(g) ____

(15 pts.) 9. Demonstrate the ability to draw a floor plan of a light commercial building and include:

(a) The appropriate layout.

(b) The applicable scale.

(c) All necessary dimensions and details.

(d) The architectural symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-5, Floor and Roof Framing.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

FLOOR AND ROOF FRAMING PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a floor and roof framing plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The floor and roof framing plans provide the structural information necessary to build the light commercial building. It is advantageous to have both plans on the same sheet. They are closely related to the foundation plan on the floor level and the roof levels. The floor framing plan indicates the floor joists size and spacing, the column sizes and number, the elevations for setting steel, beam location and sizes, and the beam and column schedules. The roof framing plan indicates the roof joist size and spacing, the columm size, the elevations for setting steel, and roof beam location and sizes. Both plans require several sections and enlarged details to properly construct the structural elements of your light commercial building.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: beam, column, L.S.J., S.J., bridging, each way, precast concrete, stirrups, ties, and reinforcing.

PREREQUISITES: Text - William P. Spence, Architecture-Design Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointer, triangles, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

FLOOR AND ROOF FRAMING PLAN

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the floor and roof framing plan.
2. Give a brief definition of the terminology related to this task package.
3. List the seven (7) major features identified on the floor framing plan.
4. Identify the nine (9) items contained in the lintel schedule.
5. Identify the four (4) items contained in the column schedule.
6. Identify the five (5) items contained in the beam schedule.
7. Name the ten (10) major structural details typically shown on the framing plans.
8. Identify four (4) errors commonly made on the floor and roof framing plans.
9. Demonstrate the ability to draw a floor and roof framing plan of a light commercial building at a scale of 1/8" = 1 ft. or as appropriate. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-26 and 16-34 on pages 397 and 399 respectively in your text book. Study the floor and roof framing plan print, Sheet A-5, from the sample set of plans.
    1. The floor and roof framing plans are important for three (3) reasons:
        (a) Provides the structural support system for floor functions to take place.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

FLOOR AND ROOF FRAMING PLAN

(b) Provides the structural support system to roof over the building.
(c) Building cannot be properly constructed without the framing plans.

2. Terms and definitiions related to this task package.
   (a) Beam - Major horizontal support framing member that usually carries lesser support joists.
   (b) Column - Major vertical support framing member that usually carries beams.
   (c) L.S.J. - The reference made on structural framing plans for "long span joist" that are utilized in column free areas.
   (d) S.J. - The reference made on structural framing plans for "steel joist" that are usually of short span supported by beams.
   (e) Bridging - Diagonal bracing between joists utilized to maintain joist alignment and stiffen flooring, p. 174.
   (f) Each Way - Terminology utilized when reinforcement is spaced equal distance in both the horizontal and vertical directions.
   (g) Precast Concrete - Concrete structural members previously fabricated for a building installation, p. 497.
   (h) Stirrups - "U" shaped steel bars used to keep main reinforcing bars in place, p. 509.
   (i) Ties - Metal wires utilized to keep the main column reinforcing bars in place, p. 509
   (j) Reinforcing - Steel bars added to concrete structural members in order to give the concrete the ability to resist tension stresses.
3. The seven (7) major features identified on the floor and roof framing plan are:
   (a) Floor framing structural members and dimension
   (b) Roof framing structural members and dimensions.
   (c) Beam schedule.
   (d) Lintel schedule.
   (e) Column schedule.
   (f) Detail indications.
   (g) Section details.
4. The nine (9) items contained in the lintel schedule.
   (a) Mark number of lintel.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

FLOOR AND ROOF FRAMING PLAN

- (b) Wall thickness.
- (c) Width of masonry opening.
- (d) Length of bearing on each end of lintel.
- (e) B - Thickness of lintel - Masonry Lintel Units
- (f) D - Depth of lintel
- (g) Bottom reinforcing bars
- (h) Top reinforcing bars
- (i) Structural steel lintels.

5. The four (4) items contained in the column schedule, p. 395.
   - (a) Column number #.
   - (b) Size of column in inches.
   - (c) Vertical reinforcing bars - number and size.
   - (d) Reinforcing ties - size and spacing.
6. The five (5) items contained in the beam schedule, p. 398.
   - (a) Beam number #.
   - (b) Size of beam in inches.
   - (c) Straight reinforcing bars - number and size.
   - (d) Bent bars - number and size.
   - (e) Stirrups and top reinforcing bars - number, size and spacing.
7. The ten (10) major structural details typically shown on the framing plan are: p. 397-400.
   - (a) Column bearing base detail.
   - (b) Column and beam connection detail.
   - (c) Beam and joist connection detail.
   - (d) Beam bearing detail.
   - (e) Precast concrete joist section.
   - (f) Floor joist detail.
   - (g) Joist detail at bearing wall.
   - (h) Joist and exterior wall section.
   - (i) Stair section.
   - (j) Details and sections necessary for structural integrity.
8. Four (4) errors commonly found on the floor and roof framing plans are: p. 397 and 399.
   - (a) Insufficient dimensions
   - (b) Lack of adequate details and sections.
   - (c) Incomplete data for proper structural integrity.
   - (d) Errors in the calculations for structural members.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

FLOOR AND ROOF FRAMING PLAN

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw the floor and roof framing plan of a light commercial building.
    - (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
    - (b) Turn to sheet A-5 of the sample blueprints.
    - (c) Draw a floor and roof framing plan for your assigned building including:
        - (1) The appropriate layout.
        - (2) The applicable scale.
        - (3) All necessary dimensions and details.
        - (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

EXIT TEST - FLOOR AND ROOF FRAMING PLAN

STUDENT'S NAME____________________________________

SCORE________________ DATE__________________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-5? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-6 - Building Elevations and Sections. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(6 pts.) 1. List three (3) major reasons for the importance of the floor and roof framing plans.

(a)________________________________

(b)________________________________

(c)________________________________

(20 pts.) 2. Define the following terms.

(a) Beam____________________________

(b) Column__________________________

(c) L.S.J.__________________________

(d) S.J.____________________________

(e) Bridging________________________

(f) Each Way________________________

(g) Precast Concrete_________________

(h) Stirrups________________________

(i) Ties____________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

EXIT TEST - FLOOR AND ROOF FRAMING PLAN

Points

(j) Reinforcing ____________________

(14 pts.) 3. List the seven (7) major features identified on the floor or roof framing plans.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________

(9 pts.) 4. Identify the nine (9) items contained in the lintel schedule.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________
(i) ____________________

(8 pts.) 5. Identify the four (4) items contained in the column schedule.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________

(10 pts.) 6. Identify the five (5) items contained in the beam schedule.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________

(10 pts.) 7. Name the ten (10) major structural details typically shown on the framing plans.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

EXIT TEST - FLOOR AND ROOF FRAMING PLAN

Points

(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________
(i) ____________________
(j) ____________________

(8 pts.) 8. Identify four (4) errors commonly made on floor and roof framing plans.

(a) ____________________
____
(b) ____________________
____
(c) ____________________
____
(d) ____________________
____

(15 pts.) 9. Demonstrate the ability to draw a floor and roof framing plan of a light commercial building and include:

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The architectural symbols.

(100 pts.) (85% or higher required for passage).

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-6, Building Elevations and Sections.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

ANSWERS TO EXIT TEST - FLOOR AND ROOF FRAMING PLANS

1. (a) Provides the structural support system for floor functions to take place.
   (b) Provides the structural support system to roof over the building.
   (c) Building cannot be properly constructed without the framing plans.
2. (a) Beam - Major horizontal support framing member that usually carries lesser support joists.
   (b) Column - Major vertical support framing member that usually carries beams.
   (c) L.S.J. - The reference made on structural framing plans for "long span joists" that are utilized in column free areas.
   (d) S.J. - The reference made on structural framing plans for "steel joists" that are usually of short span supported by beams.
   (e) Bridging - Diagonal bracing between joists utilized to maintain joist alignment and stiffen flooring.
   (f) Each way - Terminology utilized when reinforcement is spaced equal distance in both the horizontal and vertical direction.
   (g) Precast concrete - Concrete structural members previously fabricated for a building installation.
   (h) Stirrups - "U" shaped steel bars used to keep main reinforcing bars in place.
   (i) Ties - Metal wires utilized to keep the main reinforcing bars in place.
   (j) Reinforcing - Steel bars added to concrete structural members in order to give the concrete the ability to resist tension stresses.
3. (a) Floor framing structural members and dimensions.
   (b) Roof framing structural members and dimensions.
   (c) Beam schedule.
   (d) Lintel schedule
   (e) Column schedule
   (f) Detail indications (g) Section details.
4. (a) Mark # of lintel.
   (b) Wall thickness.
   (c) Width of masonry opening.
   (d) Length of bearing on each end of lintel.
   (e) B - Thickness of lintel - Masonry lintel units.
   (f) D - Depth of lintel.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-5

ANSWERS TO EXIT TEST - FLOOR AND ROOF FRAMING PLANS

4. (g) Bottom reinforcing bars - Masonry lintel units.
   (h) Top reinforcing bars
   (i) Structural steel lintels.
5. (a) Column number #.
   (b) Size of column in inches.
   (c) Vertical reinforcing bars - number and sizes.
   (d) Reinforcing ties - size and spacing.
6. (a) Beam number #.
   (b) Size of beam in inches.
   (c) Straight reinforcing bars - number and size.
   (d) Bent bars - number and size.
   (e) Stirrup and top reinforcing bars - number, size and spacing.
7. (a) Column bearing base detail.
   (b) Column and beam connection detail.
   (c) Beam and joist connection detail.
   (d) Beam bearing detail.
   (e) Precast concrete joist detail.
   (f) Floor joist detail.
   (g) Joist detail at bearing wall.
   (h) Joist and exterior wall section.
   (i) Stair section.
   (j) Details and sections necessary for structural integrity.
8. (a) Insufficient dimensions.
   (b) Lack of adequate details and sections.
   (c) Incomplete data for proper structural integrity.
   (d) Errors in the calculations for structural members.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted A-5 sheet.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

BUILDING ELEVATIONS AND SECTIONS

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw building elevations and sections with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The building elevations and sections provide the exterior views and interior sections through those views. The elevations are usually shown of each facade of the commercial building indicating the view normally recognized by the lay person. It contains the material, dimensions, window and door notations. The building sections provide the complete construction data that reveals the structure behind the facade. The main building cross section is taken through those areas that indicate the more complicated details. The building section is a convenient method of showing the combination of structural and architectural elements in a buildable manner. The building section is the architectural viewpoint of the total structure from the foundation to the roof line.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: elevation, section, grade, bearing, bond beam, vapor barrier, thermal break, courses, thin set, and expansion joint.

PREREQUISITES: Task Package-5 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, Architecture-Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointers, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (40 to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

BUILDING ELEVATIONS AND SECTIONS

take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package the student should be able to:

1. Discuss in writing the importance of the building elevations and sections.
2. Give a brief definition of the terminology related to this task package.
3. List the eight (8) major features identified on the building elevations and sections.
4. Name the four (4) common elements between elevations and sections.
5. Identify the four (4) major items contained on the interior elevations.
6. Identify the five (5) major items contained on the exterior elevation.
7. Name the five (5) major items typically shown on the elevations and sections.
8. Identify four (4) errors commonly made on elevations and sections.
9. Demonstrate the ability to draw the building elevations and sections of a light commercial building with the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-7 and 16-20 on pages 387 and 394 respectively in your textbook. Study the building elevations and sections print, Sheet A-6 from the sample set of plans.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

BUILDING ELEVATIONS AND SECTIONS

1. The building elevations and sections are important for four (4) reasons: p. 387-394.
   - (a) Elevations present the interior and exterior graphic view most readily comprehended by lay person or client.
   - (b) Sections indicate the various details necessary for the building to be fabricated.
   - (c) Building sections show complete facility structure from the roof down to the foundation.
   - (d) The combination of the elevations and the respective sections offer the contractor the best information to fulfill the intended functions.
2. Terms and definitions related to this task package.
   - (a) Elevation - A. 90° perpendicular view of the vertical face of the building, p. 149.
   - (b) Section - A perpendicular or horizontal view taken 90° through an elevation, detail or building, p. 149-150.
   - (c) Grade - Term used to indicate the exterior ground level or elevation around a building.
   - (d) Bearing - The required distance at each end of a horizontal support member necessary to transfer the loading to the vertical support, p. 293.
   - (e) Bond beam - Concrete horizontal structural member used at the top support of floor and roof to add perimeter rigidity.
   - (f) Vapor barrier - A membrane usually a polyethylene sheet placed on the warm face of a material to prevent the passage of vapor moisture, p. 310.
   - (g) Thermal break - A material, usually a poured neoprene rubber, placed between two conductive materials to prevent the transfer of cold temperatures.
   - (h) Courses - The number of masonry units, brick or block, used for dimensioning in the vertical direction.
   - (i) Thin set - Ceramic tile or other facing material applied in an especially strong latex grout of minimal thickness.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

BUILDING ELEVATIONS AND SECTIONS

(j) Expansion joint - Provides for lateral and vertical movement of adjacent materials and eliminates restraint forces.

3. The eight (8) major features identified on the building elevations and sections are: p. 387.
   (a) Four (4) exterior elevations.
   (b) Interior elevations.
   (c) Building horizontal section.
   (d) Building cross section.
   (e) Window and door notations.
   (f) Material indications.
   (g) Dimensions.
   (h) Elevation details - special to this facility
4. The four (4) common elements between elevations and sections are: p. 389.
   (a) They are usually drawn at the same scale.
   (b) The majority of dimensioning is in the vertical plane.
   (c) Elevations and sections are usually shown on the same sheet.
   (d) Details of sections are usually shown on the elevation and section sheet.
5. The four (4) items contained on the interior elevation are: p. 393.
   (a) Interior details.
   (b) Various sections appropriate for the building
   (c) Construction details.
   (d) Locates pertinent information.
6. The five (5) items contained on the exterior elevations are: p. 386-387.
   (a) Major vertical dimensions.
   (b) Type of material indicated.
   (c) Indication of sections.
   (d) Basement and footings are indicated as hidden view lines.
   (e) Indication of where enlarged details may be located.
7. The five (5) major items typically shown on the elevations and sections are: p. 386-395.
   (a) Materials.
   (b) Dimensions.
   (c) Section indications.
   (d) Detail indications.
   (e) All unique features of the building.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

BUILDING ELEVATIONS AND SECTIONS

8. Four (4) errors commonly found on the elevations and sections are: p. 386-395.
    - (a) Lack of adequate details and sections.
    - (b) Errors in dimensions.
    - (c) Insufficient dimensions.
    - (d) Elevations and sections do not properly reflect the facility's features.

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw the elevations and sections of a light commercial building.
    - (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
    - (b) Turn to sheet A-6 of the sample blueprints.
    - (c) Draw the elevations and sections for your assigned building including:
        - (1) The appropriate layout.
        - (2) The applicable scale.
        - (3) All necessary dimensions and details.
        - (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

EXIT TEST - BUILDING ELEVATIONS AND SECTIONS

STUDENT'S NAME____

SCORE_______________DATE_____________________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-6? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-7 - Light Commercial Drafting. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(8 pts.) 1. List four (4) major reasons for the importance of the building elevations and sections.

(a)____________________________________

(b)____________________________________

(c)____________________________________

(d)____________________________________

(20 pts.) 2. Define the following terms.

(a) Elevation____________________________

(b) Section______________________________

(c) Grade________________________________

(d) Bearing______________________________

(e) Bond Beam____________________________

(f) Vapor Barrier________________________

(g) Thermal Break________________________

(h) Courses______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

EXIT TEST - BUILDING ELEVATIONS AND SECTIONS

Points

(i) Thin Set ____________________

(j) Expansion Joint ____________________

(8 pts.) 3. List the eight (8) major features identified on the building elevations and sections.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________

(8 pts.) 4. Name the four (4) common elements between elevations and sections.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________

5. Identify the four (4) major items contained on the interior elevations.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________

(10 pts.) 6. Identify the five (5) major items contained on the exterior elevations.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________

(15 pts.) 7. Name the five (5) major items typically shown on the elevations and sections.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________

(8 pts.) 8. Identify four (4) errors commonly made on elevations and sections.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

EXIT TEST - BUILDING ELEVATIONS AND SECTIONS

Points

(a) ____
(b) ____
(c) ____
(d) ____

(15 pts.) 9. Demonstrate the ability to draw the elevations and sections of a light commercial building and include.

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details
(d) The architectural symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-7, Details.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

ANSWERS TO EXIT TEST - BUILDING ELEVATIONS AND SECTIONS

1. (a) Elevations present the interior and exterior graphic view most readily comprehended by the lay person or client.
   (b) Sections indicate the various details necessary for the building to be fabricated.
   (c) Building sections show complete facility structure from the roof down to the foundation.
   (d) The combination of the elevations and the respective sections offer the contractor the best information to fulfill the intended functions.
2. (a) Elevation - A 90° perpendicular view of the vertical face of the building.
   (b) Section - A perpendicular or horizontal view taken 90° through an elevation, detail or building.
   (c) Grade - Term used to indicate the exterior ground level or elevation around a building.
   (d) Bearing - The required distance at each end of a horizontal support member necessary to transfer the loading to the vertical support.
   (e) Bond beam - Concrete horizontal structural member used at the top support of floor and roof to add perimeter rigidity.
   (f) Vapor barrier - A membrane usually a polyethylene sheet placed on the warm face of a material to prevent the passage of vapor moisture.
   (g) Thermal break - A material usually a poured neoprene rubber placed between two conductive materials to prevent the transfer of cold temperature.
   (h) Courses - The number of masonry units, brick or block, used for dimensioning in the vertical direction.
   (i) Thin set - Ceramic tile or other facing material applied in an especially strong latex grout of minimal thickness.
   (j) Expansion joint - Provides for lateral and vertical movement of adjacent materials and eliminates restraint forces.
3. (a) Four exterior elevations.
   (b) Interior elevations.
   (c) Building horizontal section.
   (d) Building cross section.
   (e) Window and door notations.
   (f) Material indication.
   (g) Dimensions.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-6

ANSWERS TO EXIT TEST - BUILDING ELEVATIONS AND SECTIONS

3. (h) Elevation details - special to this particular facility.
4. (a) They are usually drawn at the same scale.
   (b) The majority of dimensioning is in the vertical plane.
   (c) Elevations and sections are shown on the same sheet
   (d) Details of sections are usually shown on the elevation and section sheet.
5. (a) Interior details.
   (b) Various sections appropriate for the building.
   (c) Construction details.
   (d) Locate pertinent information.
6. (a) Major vertical dimensions.
   (b) Type of material indicated.
   (c) Indication of sections.
   (d) Basement and footings are indicated as hidden view lines.
   (e) Indication of where enlarged details may be located
7. (a) Materials.
   (b) Dimensions.
   (c) Section indications.
   (d) Detail indications.
   (e) All unique features of the building.
8. (a) Lack of adequate details and sections.
   (b) Errors in dimensions.
   (c) Insufficient dimensions.
   (d) Elevations and sections do not properly reflect the facility features.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted Building Elevations and Sections, sheet A-6.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

DETAILS

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw details, using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The building detail sheet provides all the necessary details particularly unique to the facility. They are usually miscellaneous details showing construction connections and integrations that cannot be shown on the sheets where these details have direct reference. Also details can be shown on this sheet which do not refer to or detract from previous referenced sheets. The details of a facility are an integral part of the working drawing composition and are developed in conjunction with each drawing. Detailing can and does make or break the aesthetic strength of the design.

TERMINOLOGY: Terms used in this task package that will assist the student with the mastery of the terminal performance objective are: detail, energy wall tie, plies, inverted roof, deformed, shop drawings, bearing plate, conformed deck, flashing and 1-hour fire rated.

PREREQUISITIES: Task Package-6 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, Architecture, Design, Engineering, Drawing, engineer scale, architect scale, eraser shields, leads (H, 2H, and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light c ommercial building plan provided by the instructor.

TIME: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

DETAILS

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of details.
2. Give a brief definition of the terminology related to this task package.
3. List the eight (8) typical details usually shown on the detail sheet.
4. Identify the five (5) major items contained in an enlarged detail.
5. Name the seven (7) usual kinds of interior details.
6. Name the seven (7) usual kinds of exterior details.
7. Name the eight (8) usual kinds of structural details.
8. Identify six (6) errors commonly made on details.
9. Demonstrate the ability to draw details of a light commercial building at the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-15, 16-18, 16-17, 16-21, 16-31 and 16-26 on pages 391, 392, 393, 395, 398 and 400 in your textbook. Study the detail print, Sheet A-7, from the sample set of plans.
   1. The building details are important for four (4) reasons: p. 388-396.
      (a) Details clarify the various parts of the construction.
      (b) Details display graphically the unique items of the facility.
      (c) Details are necessary for the full information intended by the designer.
      (d) Details are responsible for supporting the aesthetic qualities of the facility.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

DETAILS

2. Terms and definitions related to this task package.
   - (a) Detail - An enlarged drawing depicting a smaller scaled portion.
   - (b) Energy Wall Tie - Masonry block horizontal reinforcement with wide spacing to allow the filling of the block cores with insulation.
   - (c) Plies - The number of membranes that comprise the composition of a built-up roofing system.
   - (d) Inverted Roof - A roofing system that applies the insulation material on top of the roofing membranes.
   - (e) Deformed - Reinforcing bars with raised ridges to provide greater surface area and holding strength.
   - (f) Shop Drawings - Drawings that illustrate the manufacturer's fabrication of the construction intended to be installed.
   - (g) Bearing Plate - A steel plate anchored to concrete or masonry construction to support beam and bar joist members.
   - (h) Flashing - The major water prevention metal enclosure.
   - (i) Conformed Deck - A metal decking used for the permanent form and the structural strength for a poured concrete floor or roof deck.
   - (j) 1 Hour Fired Rated - The time length of fire protection provided by a particular material or system of construction.
3. The eight (8) typical details usually shown on the detail sheet are:
   - (a) Door Frames
   - (b) Window Frames
   - (c) Stairs
   - (d) Structural
   - (e) Roof
   - (f) Walls
   - (g) Cabinets
   - (h) Unique Items
4. The five (5) major items contained in an enlarged detail are: p. 338.
   - (a) The detail symbol.
   - (b) Necessary dimensions.
   - (c) Material indications.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

DETAILS

   (d) Enlarged scale.
   (e) Related details are shown together.

5. The seven (7) usual kinds of interior details are: p. 393.
   (a) Cabinets.
   (b) Counters.
   (c) Built-in equipment and fixtures.
   (d) Structural details.
   (e) Interior walls for each different type.
   (f) Window and door frames.
   (g) Miscellaneous unique details of interior features.
6. The seven (7) usual kinds of exterior details are: p. 388-393.
   (a) Front entrance.
   (b) Rear entrance.
   (c) Exterior walls for each different type.
   (d) Planter boxes.
   (e) Roof.
   (f) Site and landscape.
   (g) Miscellaneous unique details of exterior features.
7. The eight (8) usual kinds of structural details are: p. 393-400.
   (a) Chimney footing.
   (b) Typical foundations.
   (c) Special foundations.
   (d) Columns and column bases
   (e) Joists and bearing support.
   (f) Beam and bearing support.
   (g) Stairs.
   (h) Miscellaneous unique details of structural features.
8. Six (6) errors commonly found on details are: p. 393-400.
   (a) Insufficient number of details.
   (b) Improper detail symbol and number.
   (c) Related details not shown together.
   (d) Lack of dimensions and material indications.
   (e) Improper material connections.
   (f) Scale too small to show enough detail.

TEAM LEARNING ACTIVITY:

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

DETAILS

9. Demonstrate the ability to draw details of a light commercial building.
   - (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
   - (b) Turn to sheet A-7 of the sample blueprints.
   - (c) Draw details of your assigned building including:
     - (1) The appropriate layout.
     - (2) The applicable scale.
     - (3) All necessary dimensions and details.
     - (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

EXIT TEST - DETAILS

STUDENT'S NAME ______________________________

SCORE ____________ DATE ____________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-7? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-8 - Electrical. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(8 pts.) 1. List four (4) major reasons for the importance of building details.

(a) ______________________________

(b) ______________________________

(c) ______________________________

(d) ______________________________

(20 pts.) 2. Define the following terms:

(a) Detail ______________________________

(b) Energy Wall Tie ______________________________

(c) Plies ______________________________

(d) Inverted Roof ______________________________

(e) Deformed ______________________________

(f) Shop Drawings ______________________________

(g) Bearing Plate ______________________________

(h) Flashing ______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

EXIT TEST - DETAILS

Points

(i) Conformed Deck ______________________________

(j) 1 Hour Fire Rated ______________________________

(8 pts.) 3. List the eight (8) typical details usually shown on the Detail Sheet.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________
(h) ______________________________

(10 pts.) 4. Identify the five (5) major items contained in an enlarged detail.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________

(7 pts.) 5. Name the seven (7) usual kinds of interior details.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________

(7 pts.) 6. Name the seven (7) usual kinds of exterior details.

(a) ______________________________
(b) ______________________________
(c) ______________________________
(d) ______________________________
(e) ______________________________
(f) ______________________________
(g) ______________________________

(8 pts.) 7. Name the eight (8) usual kinds of structural details.

(a) ______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

EXIT TEST - DETAILS

(b) ____

(c) ____

(d) ____

(e) ____

(f) ____

(g) ____

(h) ____

(18 pts.) 8. Identify six (6) errors commonly made on Details.

(a) ____

(b) ____

(c) ____

(d) ____

(e) ____

(f) ____

(14 pts.) 9. Demonstrate the ability to draw the details of a light commercial building and include.

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The architectural symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-8, Electrical Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

ANSWERS TO EXIT TEST - DETAILS

1. (a) Details clarify the various parts of the construction.
   (b) Details display graphically the unique items of the facility.
   (c) Details are necessary for the full information intended by the designer.
   (d) Details are responsible for supporting the aesthetic qualities of the facility.
2. (a) Detail - An enlarged drawing depicting a smaller scale portion of the building.
   (b) Energy Wall Tie - Masonry block horizontal reinforcement with wide spacing to allow the filling of block cores with insulation.
   (c) Plies - The number of membranes that comprise the composition of a built-up roofing system.
   (d) Inverted Roof - A roofing system that applies the insulation material on top of the roofing membranes.
   (e) Deformed - Reinforcing bars with raised ridges to provide greater surface area and holding strength in concrete construction.
   (f) Shop Drawing - Drawings that illustrate the manufacturer's fabrication of the construction intended to be installed.
   (g) Bearing Plate - A steel plate anchored to concrete or masonry construction to support beam and bar joist members.
   (h) Flashing - The major water prevention metal enclosure.
   (i) Conformed Deck - A metal decking used for the permanent form and structural strength for a poured concrete floor or roof deck.
   (j) 1 Hour Fire Rated - The time length of fire protection provided by a particular material or system of construction.
3. (a) Door frames.
   (b) Window frames.
   (c) Stairs.
   (d) Structural.
   (e) Roof.
   (f) Walls.
   (g) Cabinets.
   (h) Unique items.
4. (a) The detail symbol.
   (b) Necessary dimensions.
   (c) Material indications.
   (d) Enlarged scale.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-7

ANSWERS TO EXIT TEST - DETAILS

(e) Related details are shown together.

5. (a) Cabinets.
   (b) Counters.
   (c) Built-in equipment and fixtures.
   (d) Structural details.
   (e) Interior walls for each different type.
   (f) Window and door frames.
   (g) Miscellaneous unique details of interior features.
6. (a) Front entrance.
   (b) Rear entrance.
   (c) Exterior walls for each different type.
   (d) Planter boxes.
   (e) Roof.
   (f) Site and landscape.
   (g) Miscellaneous unique details of exterior features.
7. (a) Chimney footing.
   (b) Typical foundations.
   (c) Special foundations.
   (d) Columns and column bases.
   (e) Joists and bearing support.
   (f) Beam and bearing support.
   (g) Stairs.
   (h) Miscellaneous unique details of structural features.
8. (a) Insufficient number of details.
   (b) Improper detail symbol and number.
   (c) Related details not shown together.
   (d) Lack of dimensions and material indications.
   (e) Improper material connections.
   (f) Scale too small to show enough detail.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted Details, sheet A-7.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ELECTRICAL PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw an electrical plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The electrical plan presents the lighting and electrical services for the building. The lighting system should provide adequate lighting levels for the various areas and tasks within the architectural envelope. The lighting should complement the architectural design in all aspects. A lighting fixture schedule is provided on the electrical plan. The total electrical plan also gives all the information necessary to tell the contractor the proper circuiting of lighting and power circuits, alarm systems, service and feeders for the building's electrical system. The importance of the electrical plan is paramount and must not only be coordinated with the architectural, mechanical and structural drawings but incorporated totally with the initial parameters of the design.

TERMINOLOGY: Terms used in this Task Package that will assist the students with the mastery of the terminal performance objective are: fixture, convenience outlet, panel, service entrance, circuit, electrical riser diagram, electrical capacity, special purpose outlet, general illumination, and decorative lighting.

PREREQUISITES: Task Package-7 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, Architecture-Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ELECTRICAL PLAN

take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the electrical plan.
2. Give a brief definition of the terminology related to this task package.
3. List the ten (10) typical items shown on the electrical plan.
4. List three (3) major electrical safety devices.
5. List ten (10) items considered to be electrical special systems.
6. Name the five (5) details drawn on the electrical riser diagram.
7. List the five (5) major items contained in a lighting fixture schedule.
8. Identify nine (9) errors commonly made on the electrical plan.
9. Demonstrate the ability to draw an electrical plan of a light commercial building at the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-37, 16-38, 16-39, 16-40 and 16-41 on pages 396, 401 and 402 in your textbook. Study the electrical plan print, Sheet A-8 from the sample set of plans.
   1. The electrical plan is important for three (3) reasons: p. 396.
      (a) Graphically presents the lighting and electrical services.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ELECTRICAL PLAN

   (b) Accentuates the building's architectural elements.
   (c) Building functions cannot operate safely without good electrical systems.

2. Terms and definitions related to this task package:
   (a) Fixture - Electrical lighting for various visual tasks, p. 282.
   (b) Convenience outlet - Wall receptacle used to service electrical equipment, p. 282.
   (c) Panel - Power center that feeds electrical circuits from the main service entrance, p. 280.
   (d) Service entrance - Electrical wiring system that carries the power from the pole to the building, usually underground, p. 279.
   (e) Circuit - Wiring used to carry the electrical load to the lighting or service, p. 278.
   (f) Electrical riser diagram - A drawing that gives complete details of the panel wiring, p. 396 and 401.
   (g) Electrical capacity - The ability of the electrical system to supply sufficient current to efficiently operate, p. 277.
   (h) Special purpose outlet - Convenience outlet for a single piece of electrical equipment of high current load, p. 282.
   (i) General illumination - Overall required lighting in area not utilized for special or task lighting, p. 285.
   (j) Decorative lighting - Special lighting used to illuminate a variety of features unique to the type of facility.

3. The ten (10) typical items shown on the electrical plan are: p. 396.
   (a) Building service and feeders.
   (b) Lighting fixture layout and switching (interior and exterior).
   (c) Electrical power wiring and locations of major electrical equipment.
   (d) Receptacle layout (convenience outlets).
   (e) Telephone and alarm system.
   (f) Electrical riser diagram.
   (g) Lighting fixture schedule.
   (h) Electrical symbol legend.
   (i) Telephone and alarm system riser diagram.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ELECTRICAL PLAN

(j) Lighting details and special systems.

4. The three (3) major safety devices are: p. 282.
   (a) Fuses.
   (b) Circuit breakers.
   (c) Ground fault circuit interrupter.
5. Ten (10) items considered to be electrical special systems are: Figures 16-40, 16-41 and page 402.
   (a) Fire and smoke alarms.
   (b) Intercom and music.
   (c) Telephone.
   (d) Door bell and automatic door operator.
   (e) Time clocks.
   (f) Television.
   (g) Snow melting.
   (h) Emergency power and lighting.
   (i) Burglar alarm.
   (j) Lightning protection.
6. The five (5) details drawn on the electrical riser diagram are: p. 401.
   (a) Panel boxes.
   (b) Circuit breakers and circuits.
   (c) Outside meter.
   (d) Service entrance.
   (e) Conduit size.
7. The six (6) major items contained in a lighting fixture schedule are: Figure 16-37 and page 401.
   (a) Fixture type number.
   (b) Manufacturer's description.
   (c) Lamps - number and type.
   (d) Voltage.
   (e) Mounting height.
   (f) Remarks.
8. Nine (9) errors commonly found on the electrical plan are: p. 401 and 402.
   (a) Lack of coordination with the architectural, mechanical and structural drawings.
   (b) Insufficient information shown.
   (c) Electrical drawing not in accordance with the National Electric Code.
   (d) Improper spacing of fixtures.
   (e) Improper lighting levels.
   (f) Exposed conduit locations.
   (g) Mounting height of fixtures and equipment not shown.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ELECTRICAL PLAN

(h) Lack of required connections for equipment furnished by others.
(i) Electrical fixtures and equipment specified that are not UL approved.

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw an electrical plan of a light commercial building.
    (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
    (b) Turn to sheet A-8 of the sample blueprints.
    (c) Draw an electrical plan for your assigned building including:
        (1) The appropriate layout.
        (2) The applicable scale.
        (3) All necessary dimensions and details.
        (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

EXIT TEST - ELECTRICAL PLAN

STUDENT'S NAME____

SCORE________________ DATE________________________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-8? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-9 - Mechanical Plan. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(6 pts.) 1. List three (3) reasons for the importance of the electrical plan.

(a)____

(b)____

(c)____

(20 pts.) 2. Define the following terms.

(a) Fixture________________________________

(b) Convenience outlet________________________

(c) Panel__________________________________

(d) Service entrance_________________________

(e) Circuit________________________________

(f) Electrical riser diagram__________________

(g) Electrical capacity_______________________

(h) Special purpose outlet____________________

(i) General illumination_____________________

(j) Decorative lighting______________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

EXIT TEXT - ELECTRICAL PLAN

Points

(10 pts.) 3. List the ten (10) typical items shown on the electrical plan.

(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)
(i)
(j)

(9 pts.) 4. List the three (3) major electrical safety devices.

(a)
(b)
(c)

(10 pts.) 5. Identify ten (10) items considered to be electrical special systems.

(a)
(b)
(c)
(d)
(e)
(f)
(g)
(h)
(i)
(j)

(10 pts.) 6. Name the five (5) details drawn on the electrical riser diagram.

(a)
(b)
(c)
(d)
(e)

(10 pts.) 7. List the five (5) major items contained in a lighting fixture schedule.

(a)
(b)

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

EXIT TEST - ELECTRICAL PLAN

Points

(c) ____________________
(d) ____________________
(e) ____________________

(10 pts.) 8. Identify nine (9) errors commonly made on the electrical plan.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________
(i) ____________________

(15 pts.) 9. Demonstrate the ability to draw the electrical plan of a light commercial building and include

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The electrical symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-9, Mechanical Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ANSWERS TO EXIT TEST - ELECTRICAL PLAN

1. (a) Graphically presents the lighting and electrical service.
    - (b) Accentuates the building's architectural elements.
    - (c) Building functions cannot operate safely without good electrical plans.
2. (a) Fixture - Electrical lighting for various visual tasks.
    - (b) Convenience outlet - Wall receptacle used to service electrical equipment.
    - (c) Panel - Power center that feeds electrical circuits from the main service entrance.
    - (d) Service entrance - Electrical wiring system that carries the power from the pole to the building usually underground.
    - (e) Circuit - Wiring used to carry the electrical load to the lighting.
    - (f) Electrical Riser Diagram - A drawing that gives complete details of the panel wiring.
    - (g) Electrical capacity - The ability of the electrical systems to supply sufficient current to efficiently operate.
    - (h) Special purpose outlet - Convenience outlet for a single piece of electrical equipment of high current load.
    - (i) General illumination - Overall required lighting in area not utilized for special or task lighting.
    - (j) Decorative lighting - Special lighting used to illuminate a variety of features unique to type of facility.
3. (a) Building service and feeders.
    - (b) Lighting fixture layout and switching. (Interior or exterior).
    - (c) Electrical power wiring and locations of major electrical equipment.
    - (d) Receptacle layout (convenience outlets).
    - (e) Electrical user diagram.
    - (f) Telephone and alarm system.
    - (g) Lighting fixture schedule.
    - (h) Electrical symbol legend.
    - (i) Telephone and alarm system riser diagram.
    - (j) Lighting details and special systems.
4. (a) Fuses.
    - (b) Circuit breakers.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-8

ANSWERS TO EXIT TEST - ELECTRICAL PLAN

(c) Ground fault circuit interrupter.
5. (a) Fire and smoke alarms.
(b) Intercom and music.
(c) Telephone.
(d) Door bell and automatic door operator.
(e) Time clocks.
(f) Television.
(g) Snow melting.
(h) Emergency power and lighting.
(i) Burglar alarm.
(j) Lightning protection.
6. (a) Panel boxes.
(b) Circuit breakers and circuits.
(c) Outside meter.
(d) Service entrance.
(e) Conduit size.
7. (a) Fixture type number.
(b) Manufacturer's description.
(c) Lamps - number and types.
(d) Voltage.
(e) Mounting.
(f) Remarks.
8. (a) Lack of coordination with the architectural, mechanical and electrical drawings.
(b) Insufficient information shown.
(c) Electrical drawing not in accordance with the National Electric Code.
(d) Improper spacing of fixtures.
(e) Improper lighting levels.
(f) Exposed conduit locations.
(g) Mounting height of fixtures and equipment not shown.
(h) Lack of required connections for equipment furnished by others.
(i) Electrical fixtures and equipment specified that are not UL approved.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted Electrical Plan, sheet A-8.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

MECHANICAL PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a mechanical plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The mechanical plan presents the heating, ventilating and air conditioning systems of the commercial building. This plan also illustrates the sheet metal duct work schedule, an enlarged plan of all mechanical (major) rooms, equipment schedules, and miscellaneous mechanical equipment details. Considerable attention must be paid to the integration of the mechanical system with plumbing and electrical systems. Early coordination is a must in order to anticipate the conflicts that may occur whenever systems interfere. The mechanical plan above sets the environmental climate of the facility and is carefully designed to accommodate all the functions satisfactorily with efficiency and energy consciousness.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: louver, convector, access panel, duct, heat pump, B.T.U.H., diffuser, perimeter heating, zoned heat, total heat loss and heat gain.

PREREQUISITES: Task Package-8 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P. Spence, Architecture-Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

MECHANICAL PLAN

work will be required to take place on the students' own time.

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the mechanical plan.
2. Give a brief definition of the terminology related to this task package.
3. List the seven (7) typical items shown on the mechanical plan.
4. Name seven (7) major energy conservation measures to consider for mechanical systems.
5. List four (4) items usually shown on the diffuser schedule
6. Name four (4) items usually listed in the equipment schedule.
7. Identify the four (4) building areas that require exhaust fans in a commercial facility.
8. Identify seven (7) errors commonly made on the mechanical plan.
9. Demonstrate the ability to draw a mechanical plan of a light commercial building at the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-46, 16-48, 16-49, and 16-50 on pages 406 407 and 408 in your textbook. Study the mechanical plan print, Sheet A-9, from the sample set of plans.

   1. The mechanical plan is important for four (4) reasons:
      (a) Maintains the environmental climate of the interior spaces

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

MECHANICAL PLAN

- (b) Building functions cannot operate safely without proper mechanical systems.
- (c) It graphically presents the mechanical heating, air conditioning, and ventilation systems and equipment of the building.
- (d) The mechanical systems represent the single greatest area for energy conservation savings.

2. Terms and definitions related to this task package:
    - (a) Louver - A slated, fixed or movable finned opening to permit passage of air.
    - (b) Convector - A unit that distributes heat, air conditioning and/or ventilation by means of a fan, p. 330.
    - (c) Access panel - Maintenance door to provide entry to ductwork.
    - (d) Duct - Distributes the heat or cooling from source to demand, p. 343.
    - (e) Heat pump - A heating and cooling device that utilizes either air or water as a source of heat or cooling, p. 325 and 328.
    - (f) B.T.U.H. - British Thermal Units per Hour is the expression used to identify the unit of heat flow, p. 342.
    - (g) Diffuser - Distributes the heating and cooling from the ductwork to the space.
    - (h) Perimeter heating - Heat outlets provided on the outside perimeter walls of a facility, p. 317.
    - (i) Zoned heat - Separate areas controlled by individual thermostats to provide flexibility in a controlled environment, p. 323.
    - (j) Total heat loss and heat gain - The sum of the losses or gains of the various portions of the building, p. 343.
3. The seven (7) typical items shown on the mechanical plan are: p. 403 and 408.
    - (a) Heating, ventilating and cooling equipment
    - (b) Duct work and sizes.
    - (c) Registers and grilles.
    - (d) Controls.
    - (e) Ranges, ovens and hoods.
    - (f) Exhaust fans and vents.
    - (g) Equipment and diffuser schedules.
4. The seven (7) major energy conservation measures to consider for mechanical systems are: p. 306 and 316.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

MECHANICAL PLAN

   (a) Provide proper attic and crawl space ventilation.
   (b) Insulate all heat and air conditioning ducts.
   (c) Utilize heat reclaim devices wherever feasible.
   (d) Provide heating, ventilating, and cooling systems in zones.
   (e) Utilize fresh air for cooling whenever possible.
   (f) Install a dual duct system.
   (g) Incorporate active and passive solar system techniques to augment the mechanical systems.

5. Four (4) items usually shown on the diffuser schedule are: p. 403.
   (a) Room number location.
   (b) Quantity.
   (c) Diffuser size.
   (d) Cubic feet per minute.
6. Four (4) items usually listed in the equipment schedule are: p. 406.
   (a) Air conditioning units.
   (b) Hot water heater.
   (c) Exhauster.
   (d) Water cooler.
7. Four (4) main areas that require exhaust fans in a commercial facility are: p. 408, figure 16-50.
   (a) Restrooms.
   (b) Janitor's closets.
   (c) Kitchens.
   (d) Special equipment giving off fumes.
8. Seven (7) errors commonly found on the mechanical plan are: p. 403.
   (a) Lack of coordination with the architectural, electrical and structural drawings.
   (b) Insufficient openings and framing required for equipment, pipes and ducts.
   (c) Lack of proper electrical connections.
   (d) Equipment to be shown by others not shown.
   (e) Mounting height of equipment not shown.
   (f) Lack of proper space for equipment.
   (g) Insufficient design to handle building functions.

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw a mechanical plan of a light commercial building.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

MECHANICAL PLAN

(a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
(b) Turn to sheet A-9 of the sample blueprints.
(c) Draw a mechanical plan for your assigned building including:
  (1) The appropriate layout.
  (2) The applicable scale.
  (3) All necessary dimensions and details.
  (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

EXIT TEST - MECHANICAL PLAN

STUDENT'S NAME ____________________

SCORE ____________ DATE ____________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-9? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to continue on to Task Package-10 - Plumbing Plan. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(6 pts.) 1. List four (4) reasons for the importance of the mechanical plan.

(a) ____________________

(b) ____________________

(c) ____________________

(d) ____________________

(20 pts.) 2. Define the following terms:

(a) Louver ____________________

(b) Convector ____________________

(c) Access panel ____________________

(d) Duct ____________________

(e) Heat pump ____________________

(f) B.T.U.H. ____________________

(g) Diffuser ____________________

(h) Perimeter heating ____________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

EXIT TEST - MECHANICAL PLAN

Points

(i) Zoned heat

(j) Total heat loss and heat gain

(14 pts.) 3. List the seven (7) typical items shown on the mechanical plan.
(a)
(b)
(c)
(d)
(e)
(f)
(g)

(7 pts.) 4. Name seven (7) major energy conservation measures to consider for mechanical systems.
(a)
(b)
(c)
(d)
(e)
(f)
(g)

(8 pts.) 5. List four (4) items usually shown on the diffuser schedule.
(a)
(b)
(c)
(d)

(8 pts.) 6. Name four (4) items usually listed in the equipment schedule.
(a)
(b)
(c)
(d)

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

EXIT TEST - MECHANICAL PLAN

Points

(8 pts.) 7. Identify four (4) building areas that require exhaust fans in a commercial facility.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________

(14 pts.) 8. Identify seven (7) errors commonly made on the mechanical plan.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________

(15 pts.) 9. Demonstrate the ability to draw the mechanical plan for a light commercial building and include:

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The mechanical symbols.

(100 pts.) (85% or higher required for passage.

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to proceed to Task Package-10 - Plumbing Plan.

CONGRATULATIONS!

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

ANSWERS TO EXIT TEST - MECHANICAL PLAN

1. (a) Maintains the environmental climate of the interior space.
   (b) Building functions cannot operate safely without proper mechanical systems.
   (c) It graphically presents the mechanical, air conditioning, and ventilation systems and equipment of the building.
   (d) The mechanical systems represent the single greatest area for energy savings.
2. (a) Louver - A slated, fixed or movable finned opening to permit passage of air.
   (b) Convector - A unit that distributes heat, air conditioning and ventilation by means of a fan.
   (c) Access panel - Maintenance door to provide entry to the ductwork.
   (d) Duct - Distributes the heat or cooling from source to demand.
   (e) Heat pump - A heating and cooling device that utilizes either air or water as a source of heat or cooling.
   (f) B.T.U.H. - British thermal units per hour is the expression used to identify the unit of heat flow.
   (g) Diffuser - Distributes the heating and cooling from the ductwork to the space.
   (h) Perimeter heating - Heat outlets provided on the outside perimeter walls of a facility.
   (i) Zoned heat - Separate areas controlled by individual thermostats to provide flexibility in a controlled environment.
   (j) Total heat loss and heat gain - The sum of the loss or gains of the various portions of the building.
3. (a) Heating, ventilating and cooling equipment.
   (b) Ductwork and sizes.
   (c) Registers and grilles.
   (d) Controls.
   (e) Ranges, ovens and hoods.
   (f) Exhaust fans and vents.
   (g) Equipment and diffuser schedules.
4. (a) Provide proper attic and crawl space ventilation.
   (b) Insulate all heating and air conditioning ducts.
   (c) Utilize heat reclaim devices wherever feasible.
   (d) Provide heating, ventilating and cooling systems in zones.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-9

ANSWERS TO EXIT TEST - MECHANICAL PLAN

(e) Utilize fresh air for cooling whenever possible.
(f) Install a dual duct system.
(g) Incorporate active and passive solar system techniques to augment the mechanical systems.

5. (a) Room number location.
   (b) Quantity.
   (c) Diffuser size.
   (d) Cubic feet per minute.
6. (a) Air conditioning units.
   (b) Hot water heater.
   (c) Exhauster.
   (d) Water coolers.
7. (a) Restrooms.
   (b) Janitor's closet.
   (c) Kitchens.
   (d) Special equipment giving off fumes.
8. (a) Lack of coordination with architectural, electrical and structural drawings.
   (b) Insufficient openings and framing required for equipment, pipes and ducts.
   (c) Lack of proper electrical connections.
   (d) Equipment to be furnished by others not shown.
   (e) Mounting height of equipment not shown.
   (f) Lack of proper space for equipment.
   (g) Insufficient design to handle building functions.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted mechanical plan, sheet A-9.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

PLUMBING PLAN

TERMINAL PERFORMANCE OBJECTIVE: After completion of this Task Package, the learner will draw a plumbing plan with all the necessary details using the appropriate symbols and scale as evidenced through demonstration and by scoring 85 percent on the exit test.

RATIONALE: The plumbing plan presents the graphical representation of the major plumbing services, systems, fixtures, and equipment including all the piping requirements. This plan contains the fixture schedule, fresh water and disposal systems in compliance with the uniform plumbing code and Public Health Department regulations. In addition, the plumbing system shows exterior drains, sewers, catch basins, hydrants, fire fighting equipment, and sprinkler system. The importance of the plumbing plan is self explanatory because it deals with water quality and waste disposal functions of the commercial building necessary for the public health and welfare of its occupants.

TERMINOLOGY: Terms used in this Task Package that will assist the student with the mastery of the terminal performance objective are: drain, lavatory, water closet, standpipe, siamese connection, fixture unit, vent, soil pipe, waste pipe and trap.

PREREQUISITIES: Task Package-9 exit test score of 85 percent or greater.

EQUIPMENT: Text - William P Spence, Architecture-Design, Engineering, Drawing, engineer scale, architect scale, eraser shield, leads (H, 2H, and 3H), lead pointer, triangle, T-square, 24" x 36" vellum paper, lead holders, references, and a sample set of a light commercial building plans provided by the instructor.

TIME: This Task Package should be completed in four (4) to six (6) hours.

PLACE: This Task Package can be accomplished in the drafting room and at home. The drafting team work will be required to take place in the drafting room. The individual drafting work will be required to take place on the student's own time.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

PLUMBING PLAN

SAFETY REQUIREMENTS:

1. All electrical equipment should be grounded.
2. Use adequate task lighting.
3. Be aware of equipment points and edges.
4. Keep eraser pounce away from eyes.

ENABLING OBJECTIVES: After completion of this task package, the student should be able to:

1. Discuss in writing the importance of the plumbing plan.
2. Give a brief definition of the terminology related to this task package.
3. List the seven (7) typical items shown on the plumbing plan.
4. Name the seven (7) major items contained in a plumbing schedule.
5. Indicate the nine (9) items usually identified with the plumbing equipment.
6. Name the nine (9) types of fire extinguishing systems.
7. List the five (5) traps typically used in plumbing work.
8. Identify the eight (8) errors commonly made on the plumbing plan.
9. Demonstrate the ability to draw a plumbing plan of a light commercial building at the appropriate scale. (a) Demonstration shall take place in the drafting team setting.

INDIVIDUAL LEARNING ACTIVITY:

A. Read and study the pages listed after each enabling objective in the course textbook.

B. Study figures 16-43, 16-44, and 16-45 on pages 403, 404, and 405 in your textbook. Study the plumbing plan print, Sheet A-10 from the sample set of plans. Refer also to Chapter II, Plumbing, on pages 293 to 305 and Figure 11-2.

   1. The plumbing plan is important for three (3) reasons, p. 403.
      (a) Maintains the water quality.
      (b) Building systems cannot function properly without an accurate plumbing plan.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

PLUMBING PLAN

(c) It graphically represents the water distribution and waste disposal systems.

2. Terms and definitions related to this task package:
   (a) Drain - Receive waste from soil and waste pipes and transmits it to the building sewer, p. 293.
   (b) Lavatory - Plumbing fixture commonly referred to as a sink.
   (c) Water closet - Plumbing fixture commonly referred to as a toilet.
   (d) Standpipe - A system of fixed piping that supplies nozzles for use in fire fighting building systems.
   (e) Siamese connection - Fire hose connection at the bottom of a standpipe to supply water and pressure to the building fixed piping.
   (f) Fixture unit - Value used to determine the size of piping based on the volume of water discharged by a fixture, p. 298 and 299.
   (g) Vent - Vertical piping used to introduce air in the piping system to maintain atmospheric pressure, p. 300.
   (h) Soil pipe - Piping that transmits water closet waste to the building drain, p. 293.
   (i) Waste pipe - Piping that transmits other than human waste to the building drain, p. 293.
   (j) Trap - A pipe fitting used to prevent the passage of sewer gas into the building, p. 300.
3. The seven (7) typical items shown on the plumbing plan are: p. 404 and 405.
   (a) Hot and cold water supply system.
   (b) Waste, storm, and soil disposal systems.
   (c) Fire sprinkler system.
   (d) Typical large scale toilet room plan.
   (e) Water supply riser diagram.
   (f) Waste riser diagram.
   (g) Plumbing equipment.
4. The seven (7) major items contained in a plumbing schedule are: p. 404.
   (a) Type of fixture.
   (b) Quantity of each fixture.
   (c) Cold water supply pipe size required for each fixture.
   (d) Hot water supply pipe size required for each fixture.

    (e) Waste pipe size required for each fixture.
    (f) Vent size required for each fixture.
    (g) Trap size required for each fixture.

5. The nine (9) items usually identified with the plumbing equipment are: p. 404 and 405.
    (a) Sinks, lavatories, tubs and showers.
    (b) Hydrants, floor drains, yard drains, roof drains and catch basins.
    (c) Sewage pumps and ejectors.
    (d) Water treatment and heating.
    (e) Fountains.
    (f) Water closets and urinals.
    (g) Dishwashers, garbage disposals, grease receptors and washers.
    (h) Fire fighting equipment.
    (i) Fuel piping.
6. The nine (9) types of fire extinguishing systems:
    (a) Dry pipe system.
    (b) Wet pipe system.
    (c) Deluge system.
    (d) Foam system.
    (e) CO_2 system.
    (f) Hose standpipe system.
    (g) Limited water supply system.
    (h) Pre-action system.
    (i) Combined dry pipe and pre-action system.
7. The five (5) traps typically used in plumbing work are: p. 300.
    (a) P-trap.
    (b) Drum trap.
    (c) S-trap.
    (d) ½S-trap.
    (e) Running trap.
8. The eight (8) errors most commonly found on the plumbing plan are: p. 403-405.
    (a) Lack of proper space clearance for piping and connections.
    (b) Insufficient number of support hangers for piping.
    (c) Lack of testing the piping before covering with concrete.
    (d) Lack of coordination with the architectural, electrical, mechanical and structural drawings.
    (e) Lack of proper plumbing connections.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

PLUMBING PLAN

(f) Insufficient design for building functions.
(g) Plumbing fixtures inexcessible for the handicapped.
(h) Insufficient space for equipment.

TEAM LEARNING ACTIVITY:

9. Demonstrate the ability to draw a plumbing plan of a light commercial building.
   (a) Obtain a sheet of 24" x 36" vellum paper from the instructor.
   (b) Turn to sheet A-10 of the sample blueprints.
   (c) Draw a plumbing plan for your assigned building including:
      (1) The appropriate layout.
      (2) The applicable scale.
      (3) All necessary dimensions and details.
      (4) The architectural symbols.

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

EXIT TEST - PLUMBING PLAN

STUDENT'S NAME______________________________

SCORE______________DATE______________________

TIME 1 hour EQUIPMENT Supplied by instructor.

EXIT TEST: The exit test is administered to test your achievement. Are you ready for the final evaluation on Task Package-10? Do you have any questions? If so, see your instructor for help. If not, go on to the Exit Test. Passage of 85 percent or more allows you to complete the task package portion of this course. Below 85 percent requires you to do remedial work and retest.

Points COMPLETION. Fill in blanks with correct answers.

(6 pts.) 1. List three (3) reasons for the importance of the plumbing plan.

(a)______________________________

(b)______________________________

(c)______________________________

(20 pts.) 2. Define the following terms:

(a) Drain______________________________

(b) Lavatory______________________________

(c) Water closet______________________________

(d) Standpipe______________________________

(e) Siamese connection______________________________

(f) Fixture unit______________________________

(g) Vent______________________________

(h) Soil pipe______________________________

(i) Waste pipe______________________________

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

EXIT TEST - PLUMBING PLAN

Points

(14 pts.) 3. List the seven (7) typical items shown on the plumbing plan.

(a) ____
____
(b) ____
____
(c) ____
____
(d) ____
____
(e) ____
____
(f) ____
____
(g) ____
____

(14 pts.) 4. Name the seven (7) major items contained in a plumbing schedule.

(a) ____
(b) ____
(c) ____
(d) ____
(e) ____
(f) ____
(g) ____

(9 pts.) 5. Indicate the nine (9) items usually identified with the plumbing equipment.

(a) ____
(b) ____
(c) ____
(d) ____
(e) ____
(f) ____
(g) ____
(h) ____
(i) ____

(9 pts.) 6. Name the nine (9) types of fire extinguishing systems.

(a) ____
(b) ____
(c) ____
(d) ____

LIGHT COMMERCIAL DRAFTING

TASK PACKAGE-10

EXIT TEST - PLUMBING PLAN

(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________
(i) ____________________

(5 pts.) 7. List the five (5) traps typically used in plumbing work.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________

(8 Pts.) 8. Identify eight (8) errors commonly made on the plumbing plan.

(a) ____________________
(b) ____________________
(c) ____________________
(d) ____________________
(e) ____________________
(f) ____________________
(g) ____________________
(h) ____________________

(15 pts.) 9. Demonstrate the ability to draw the plumbing plan for a light commercial building and include:

(a) The appropriate layout.
(b) The applicable scale.
(c) All necessary dimensions and details.
(d) The plumbing symbols.

(100 pts.) (85% or higher required for passage.)

NOTE: Return the exit test to the instructor for evaluation. Successful completion qualifies you to complete the task package portion of this course.

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ANSWERS TO EXIT TEST - PLUMBING PLAN

1. (a) Maintains the water quality.
   (b) Building systems cannot function properly without an accurate plumbing plan.
   (c) It graphically represents the water distribution and waste disposal systems.
2. (a) Drain - Receives waste from soil and waste pipes and transmits it to the building sewer.
   (b) Lavatory - Plumbing fixture commonly referred to as a sink.
   (c) Water closet - Plumbing fixture commonly referred to as a toilet.
   (d) Standpipe - A system of fixed fire piping that supplies nozzles for use in fire fighting building systems.
   (e) Siamese connection - Firehose connection at the bottom of a standpipe to supply water and pressure to the building fixed piping.
   (f) Fixture unit - Valve used to determine the size of piping based on the volume of water discharged by a fixture.
   (g) Vent - Vertical piping used to introduce air in the piping system to maintain atmospheric pressure.
   (h) Soil pipe - Piping that transmits water closet waste to the building drain.
   (i) Waste pipe - Piping that transmits other than waste to the building drain.
   (j) Trap - A pipe fitting used to prevent the passage of sewer gas into the building.
3. (a) Hot and cold water supply.
   (b) Waste, storm, and soil disposal systems.
   (c) Fire sprinkler system.
   (d) Typical large scale toilet room scale.
   (e) Water supply riser diagram.
   (f) Waste supply riser diagram.
   (g) Plumbing equipment.
4. (a) Type of fixture.
   (b) Quantity of each fixture.
   (c) Cold water supply pipe size required for each fixture.
   (d) Hot water supply pipe size required for each fixture.
   (e) Waste pipe size required for each fixture.
   (f) Vent pipe size required for each fixture.
   (g) Trap size required for each fixture.

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TASK PACKAGE-10

ANSWERS TO EXIT TEST - PLUMBING PLAN

5. (a) Sinks, lavatories, tubs and showers.
   (b) Hydrants, floor drains, yard drains, roof drains, and catch basins.
   (c) Sewage pumps and ejectors.
   (d) Water treatment and heating.
   (e) Fountains.
   (f) Water closets and urinals.
   (g) Dishwasher, garbage disposals, grease receptors and washers.
   (h) Fire fighting equipment.
   (i) Fuel piping.
6. (a) Dry pipe system.
   (b) Wet pipe system.
   (c) Deluge system.
   (d) Foam system.
   (e) CO_2 system.
   (f) Hose standpipe system.
7. (a) P-trap.
   (b) Drum trap.
   (c) S-trap.
   (d) ½S-trap.
   (e) Running trap.
8. (a) Lack of proper space clearance for piping and connections.
   (b) Insufficient number of support hangers for piping.
   (c) Lack of testing the piping before covering with concrete.
   (d) Lack of coordination with the architectural, electrical, mechanical and structural drawings.
   (e) Lack of proper plumbing connections.
   (f) Insufficient design for building functions.
   (g) Plumbing fixtures inexcessible for the handicapped.
   (h) Insufficient space for equipment.
9. Team Learning Activity performance skills will be evaluated by the instructor in accordance with the student's submitted plumbing plan, sheet A-10.